STIC Search Report
EIC 1700

Scientific & Technical Information Center
USPTO

STIC Database Tracking Number: 118677

TO: Raymond Alejandro
Location: REM 6B59
Art Unit : 1745
April 9, 2004
Case Serial Number: 10/086862

From: John Calve
Location: CP 3/4; 3D62
Phone: 308-4139

John.Calve@uspto.gov

Search Notes

sira
Search and Information Resources Administration

Access DB# 118677

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Raymond Alejandro Examiner #: 76895 Date: 04/05/04
Art Unit: 1745 Phone Number ~~30~~(571)272-1282 Serial Number: 10/086862
Mail Box and Bldg/Room Location: Rem 6B59 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Catalytic Humidifier & Heater For the Fuel Stream of a Fuel Cell

Inventors (please provide full names): Chen et al

Earliest Priority Filing Date: 03/04/02 US2002 0098397

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

Divison of 09/992,950

Please, search for subject matter of claims 13-27. (attached copy).

****

STAFF USE ONLY	**Type of Search**		**Vendors and cost where applicable**
Searcher: John Calve	NA Sequence (#)	1139	STN X $ [redacted]
Searcher Phone #: 703-307-	AA Sequence (#)		Dialog
Searcher Location:	Structure (#)		Questel/Orbit
Date Searcher Picked Up: 4/8/04	Bibliographic	✓	Dr.Link
Date Completed: 4/9/04	Litigation		Lexis/Nexis
Searcher Prep & Review Time: 120	Fulltext		Sequence Systems
Clerical Prep Time:	Patent Family		WWW/Internet
Online Time: 120	Other		Other (specify)

PTO-1590 (8-01)

```
=> d his nofile

     FILE 'HCA' ENTERED AT 08:45:39 ON 09 APR 2004
                E 20020098397/PN
                E US20020098397/PN
L1            1 SEA ABB=ON  PLU=ON  US2002098397/PN
                D SCAN
                D L1 ALL
L2       249068 SEA ABB=ON  PLU=ON  FUELCELL? OR BATTERY? OR BATTERIES? OR
                (FUEL? OR ELECTROCHEM? OR ELECTRO(W)CHEM? OR GALVAN? OR
                ELECTROLY? OR SECONDAR? OR PRIMAR?)(2A)CELL? OR FC OR SOFC OR
                DFC OR PEMFC
L3       942418 SEA ABB=ON  PLU=ON  PLURAL? OR MANY## OR STACK? OR MULTIPL?
OR
                GROUPING?
L4       783737 SEA ABB=ON  PLU=ON  INLET? OR INJECT? OR INPUT?
L5       813117 SEA ABB=ON  PLU=ON  ANOD? OR CATHOD? OR ELECTROD?

     FILE 'LCA' ENTERED AT 09:21:57 ON 09 APR 2004

L6         3774 SEA ABB=ON  PLU=ON  CATALY? OR ACTIVATOR? OR ACCELERANT? OR
                ACCELERAT!R?
L7         2956 SEA ABB=ON  PLU=ON  REFORMATE? OR FUEL? OR H2 OR HYDROGEN#
L8         4447 SEA ABB=ON  PLU=ON  OXIDIZ? OR OXIDIS? OR OXYGEN# OR O2 OR
                AIR?
L9         4439 SEA ABB=ON  PLU=ON  SPLIT? OR DIVID? OR DIVISION? OR SEPARAT?
L10         815 SEA ABB=ON  PLU=ON  HUMID? OR MOIST? OR DAMP?
L11       13581 SEA ABB=ON  PLU=ON  CATALY?(2A)REACT? OR REACT? OR REFORMER?
L12        6076 SEA ABB=ON  PLU=ON  PREHEAT? OR PRE(A)HEAT? OR WARM? OR HEAT?
L13        1121 SEA ABB=ON  PLU=ON  CHANNEL? OR CONDUIT? OR DUCT? OR PASSAGE?
                OR TROUGH? OR TUNNEL?
L14          25 SEA ABB=ON  PLU=ON  FLOW?(2A)(PLAT? OR FIELD?)
L15        6705 SEA ABB=ON  PLU=ON  RATE? OR SPEED? OR VELOCIT?
L16        1354 SEA ABB=ON  PLU=ON  TUBE? OR TUBUL? OR PRISM? OR BUTTON?
L17        3549 SEA ABB=ON  PLU=ON  CAS#######
L18         119 SEA ABB=ON  PLU=ON  VALVE? OR BACK?(2A)FLOW?
L19          53 SEA ABB=ON  PLU=ON  ARREST? OR FLASH(2A)ARREST?

     FILE 'HCA' ENTERED AT 09:42:15 ON 09 APR 2004
L20       13236 SEA ABB=ON  PLU=ON  (L7 OR FUEL)(2A)(L9 OR SPLIT)
L21        3266 SEA ABB=ON  PLU=ON  L2 AND L20
L22       21376 SEA ABB=ON  PLU=ON  L7(2A)L12
L23          83 SEA ABB=ON  PLU=ON  L21 AND L22
L24          22 SEA ABB=ON  PLU=ON  L23 AND L3
L25           3 SEA ABB=ON  PLU=ON  L24 AND L4
                D SCAN
L26           3 SEA ABB=ON  PLU=ON  L25 AND (L5 OR L8 OR L10 OR L13)
L27     1787397 SEA ABB=ON  PLU=ON  L8 OR OXIDIZE
L28          13 SEA ABB=ON  PLU=ON  L24 AND L5
L29          13 SEA ABB=ON  PLU=ON  L28 AND (L6 OR L7 OR L27)
L30        1960 SEA ABB=ON  PLU=ON  (L7 OR FUEL)(2A)L10
```

```
L31             2 SEA ABB=ON  PLU=ON  L29 AND L30
L32             0 SEA ABB=ON  PLU=ON  L29 AND L18
L33             0 SEA ABB=ON  PLU=ON  L24 AND L19
L34             0 SEA ABB=ON  PLU=ON  L24 AND L18
L35             1 SEA ABB=ON  PLU=ON  L23 AND (L18 OR L19)
                  D SCAN
L36             2 SEA ABB=ON  PLU=ON  L29 AND L11
L37             3 SEA ABB=ON  PLU=ON  L29 AND L13
L38             0 SEA ABB=ON  PLU=ON  L29 AND L14
L39             2 SEA ABB=ON  PLU=ON  L24 AND L14
L40         81969 SEA ABB=ON  PLU=ON  CONTROL?(3A)(FLOW? OR L7 OR L15)
L41             3 SEA ABB=ON  PLU=ON  L23 AND L40
L42            14 SEA ABB=ON  PLU=ON  L25 OR L26 OR L31 OR L35 OR L36 OR L37 OR
                  L39 OR L41
L43            14 SEA ABB=ON  PLU=ON  L42 AND 1907-2002/PY,PRY
L44            15 SEA ABB=ON  PLU=ON  L1 OR L43
L45         40508 SEA ABB=ON  PLU=ON  L3(3A)(CELL? OR L2)
L46            10 SEA ABB=ON  PLU=ON  L44 AND L45
L47            15 SEA ABB=ON  PLU=ON  L44 OR L46

     FILE 'JAPIO' ENTERED AT 09:57:55 ON 09 APR 2004


L48        132716 SEA ABB=ON  PLU=ON  FUELCELL? OR BATTERY? OR BATTERIES? OR
                  (FUEL? OR ELECTROCHEM? OR ELECTRO(W)CHEM? OR GALVAN? OR
                  ELECTROLY? OR SECONDAR? OR PRIMAR?)(2A)CELL? OR FC OR SOFC OR
                  DFC OR PEMFC
L49        966407 SEA ABB=ON  PLU=ON  PLURAL? OR MANY## OR STACK? OR MULTIPL?
OR
                  GROUPING?
L50        968887 SEA ABB=ON  PLU=ON  INLET? OR INJECT? OR INPUT?
L51        471963 SEA ABB=ON  PLU=ON  ANOD? OR CATHOD? OR ELECTROD?
L52        221240 SEA ABB=ON  PLU=ON  REFORMATE? OR FUEL? OR H2 OR HYDROGEN#
L53        148545 SEA ABB=ON  PLU=ON  HUMID? OR MOIST? OR DAMP?
L54        688114 SEA ABB=ON  PLU=ON  L9 OR SPLIT
L55          4159 SEA ABB=ON  PLU=ON  L52(3A)L54
L56          4512 SEA ABB=ON  PLU=ON  L48(3A)L49
L57           115 SEA ABB=ON  PLU=ON  L55 AND L56
L58            68 SEA ABB=ON  PLU=ON  L57 AND L51
L59           851 SEA ABB=ON  PLU=ON  (L53 OR HUMID)(3A)(L7 OR FUEL)
L60            68 SEA ABB=ON  PLU=ON  L58 AND L57
L61             1 SEA ABB=ON  PLU=ON  L58 AND L59
L62             7 SEA ABB=ON  PLU=ON  L60 AND L50
L63             1 SEA ABB=ON  PLU=ON  L62 AND L6
L64             4 SEA ABB=ON  PLU=ON  L62 AND L8
L65        737065 SEA ABB=ON  PLU=ON  L14 OR L15
L66             2 SEA ABB=ON  PLU=ON  L62 AND L65
L67        291450 SEA ABB=ON  PLU=ON  L18 OR L19
L68             1 SEA ABB=ON  PLU=ON  L62 AND L67
L69             2 SEA ABB=ON  PLU=ON  L60 AND L67
L70             4 SEA ABB=ON  PLU=ON  L60 AND L65
L71          2198 SEA ABB=ON  PLU=ON  L12(3A)L2
L72             2 SEA ABB=ON  PLU=ON  L58 AND L71
                  D SCAN
L73            13 SEA ABB=ON  PLU=ON  L61 OR L62 OR L63 OR L64 OR L66 OR L68 OR
```

```
                L69 OR L70 OR L72


     FILE 'WPIX' ENTERED AT 10:41:58 ON 09 APR 2004

L74       232414 SEA ABB=ON  PLU=ON  FUELCELL? OR BATTERY? OR BATTERIES? OR
                 (FUEL? OR ELECTROCHEM? OR ELECTRO(W)CHEM? OR GALVAN? OR
                 ELECTROLY? OR SECONDAR? OR PRIMAR?)(2A)CELL? OR FC OR SOFC OR
                 DFC OR PEMFC
L75       740628 SEA ABB=ON  PLU=ON  PLURAL? OR MANY## OR STACK? OR MULTIPL?
OR
                 GROUPING?
L76      1297511 SEA ABB=ON  PLU=ON  INLET? OR INJECT? OR INPUT?
L77      1297511 SEA ABB=ON  PLU=ON  INLET? OR INJECT? OR INPUT?
L78       621133 SEA ABB=ON  PLU=ON  ANOD? OR CATHOD? OR ELECTROD?
L79       455046 SEA ABB=ON  PLU=ON  REFORMATE? OR FUEL? OR H2 OR HYDROGEN#
L80       307008 SEA ABB=ON  PLU=ON  HUMID? OR MOIST? OR DAMP?
L81      1320876 SEA ABB=ON  PLU=ON  L9 OR SPLIT
L82         9107 SEA ABB=ON  PLU=ON  L81(2A)L79
L83         2191 SEA ABB=ON  PLU=ON  L80(3A)L79
L84         4487 SEA ABB=ON  PLU=ON  L3(2A)L74
L85           68 SEA ABB=ON  PLU=ON  L82 AND L83
L86            7 SEA ABB=ON  PLU=ON  L85 AND L84
L87        61954 SEA ABB=ON  PLU=ON  HUMID?
L88            6 SEA ABB=ON  PLU=ON  L86 AND L87
L89            7 SEA ABB=ON  PLU=ON  L86 OR L88
                 D SCAN
L90            4 SEA ABB=ON  PLU=ON  L78 AND L89
L91            1 SEA ABB=ON  PLU=ON  L89 AND L6
L92            4 SEA ABB=ON  PLU=ON  L85 AND L6
L93           12 SEA ABB=ON  PLU=ON  L85 AND (L18 OR L19)
L94            3 SEA ABB=ON  PLU=ON  L93 AND (L13 OR L14)
L95            2 SEA ABB=ON  PLU=ON  L93 AND (L16 OR L17)
L96        17632 SEA ABB=ON  PLU=ON  L75(3A)(L74 OR CELL?)
L97            1 SEA ABB=ON  PLU=ON  L93 AND L96
L98            7 SEA ABB=ON  PLU=ON  L85 AND L96
L99           12 SEA ABB=ON  PLU=ON  L86 OR L88 OR L89 OR L90 OR L91 OR L92 OR
                 L94 OR L97 OR L98
L100           9 SEA ABB=ON  PLU=ON  L93 NOT L99


     FILE 'INSPEC, COMPENDEX, NTIS' ENTERED AT 10:53:53 ON 09 APR 2004

L101      125627 SEA ABB=ON  PLU=ON  L2
L102     1507056 SEA ABB=ON  PLU=ON  L3
L103      738150 SEA ABB=ON  PLU=ON  L4
L104      422754 SEA ABB=ON  PLU=ON  L5
L105      718119 SEA ABB=ON  PLU=ON  L7
L106      251704 SEA ABB=ON  PLU=ON  L10
L107        5526 SEA ABB=ON  PLU=ON  L9(3N) L105
L108         150 SEA ABB=ON  PLU=ON  L106(3N) L101
L109       13520 SEA ABB=ON  PLU=ON  L3(3N)(L2 OR CELL#######)
```

```
L110          1509 SEA ABB=ON  PLU=ON  L106(3N) L105
L111          7391 SEA ABB=ON  PLU=ON  (PLURAL? OR MANY? OR
MULTIPL?)(2N)(CELL####
                   ## OR BATTER######)
L112         13524 SEA ABB=ON  PLU=ON  L109 OR L111
L113            50 SEA ABB=ON  PLU=ON  L107 AND L112
L114            68 SEA ABB=ON  PLU=ON  L110 AND L108
L115             0 SEA ABB=ON  PLU=ON  L113 AND L114
L116          8606 SEA ABB=ON  PLU=ON  HUMID?/TI
L117            24 SEA ABB=ON  PLU=ON  L114 AND L116
L118             0 SEA ABB=ON  PLU=ON  L117 AND L107
L119             0 SEA ABB=ON  PLU=ON  L107 AND L108
L120           150 SEA ABB=ON  PLU=ON  L108 AND L101
L121             0 SEA ABB=ON  PLU=ON  L120 AND L111
L122            11 SEA ABB=ON  PLU=ON  L120 AND L103
L123             7 SEA ABB=ON  PLU=ON  L122 AND L5
L124             0 SEA ABB=ON  PLU=ON  L120 AND (L18 OR L19)
L125        831320 SEA ABB=ON  PLU=ON  L13 OR L14
L126             4 SEA ABB=ON  PLU=ON  L122 AND L125
                   D SCAN L122
L127             2 SEA ABB=ON  PLU=ON  L117 AND L125
L128             2 SEA ABB=ON  PLU=ON  L117 AND (L16 OR L17)
L129             9 SEA ABB=ON  PLU=ON  L128 OR L127 OR L126 OR L123
L130             4 SEA ABB=ON  PLU=ON  L122 NOT L129
L131            20 SEA ABB=ON  PLU=ON  L117 NOT (L129 OR L122)
                   SET MSTEPS ON

     FILE 'HCA, JAPIO, WPIX, INSPEC, COMPENDEX, NTIS' ENTERED AT 11:12:47 ON
     09 APR 2004
L132            75 DUP REM L47 L73 L99 L100 L129 L130 L131 (7 DUPLICATES REMOVED)
L133            15 SEA L132
L134            15 SEA ABB=ON  PLU=ON  L133 AND (BATTER? OR FUEL? OR CELL?)
L135            13 SEA L132
L136            13 SEA ABB=ON  PLU=ON  L135 AND (BATTER? OR FUEL? OR CELL?)
L137            12 SEA L132
L138             9 SEA L132
L139            19 SEA ABB=ON  PLU=ON  (L137 OR L138) AND (BATTER? OR FUEL? OR
                   CELL?)
L140             2 SEA L132
L141             3 SEA L132
L142            11 SEA L132
L143            16 SEA ABB=ON  PLU=ON  (L140 OR L141 OR L142) AND (BATTER? OR
                   FUEL? OR CELL?)
L144             4 SEA L132
L145             4 SEA L132
L146             8 SEA ABB=ON  PLU=ON  (L144 OR L145) AND (BATTER? OR FUEL? OR
                   CELL?)
L147             1 SEA L132
L148             1 SEA L132
L149             2 SEA ABB=ON  PLU=ON  (L147 OR L148) AND (BATTER? OR FUEL? OR
                   CELL?)
     TOTAL FOR ALL FILES
L150            73 SEA ABB=ON  PLU=ON  L132 AND (BATTER? OR FUEL? OR CELL?)
                   SET MSTEPS OFF
L151             2 SEA ABB=ON  PLU=ON  L132 NOT L150
```

```
                  D SCAN
L152            1 SEA ABB=ON  PLU=ON  L151 AND PATIENT#
L153            1 SEA ABB=ON  PLU=ON  L151 NOT L152
```

=> file hca

FILE 'HCA' ENTERED AT 11:16:56 ON 09 APR 2004

FILE COVERS 1907 - 8 Apr 2004 VOL 140 ISS 16
FILE LAST UPDATED: 8 Apr 2004 (20040408/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d L47 1-15 ti

L47 ANSWER 1 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Production of electric power and process heat

L47 ANSWER 2 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Computation of the conjugating **heat** transfer of **fuel** and oxidant **separated** by a heat-generating cell tube in a solid oxide **fuel cell**

L47 ANSWER 3 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Gas **preheating** structure for **fuel cell stack**

L47 ANSWER 4 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI **Stacked fuel cell** using pure **hydrogen fuel** and showing high energy conversion efficiency

L47 ANSWER 5 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Thermoelectric reformer **fuel cell** process

L47 ANSWER 6 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cell** with internal reforming unit

L47 ANSWER 7 OF 15 HCA COPYRIGHT 2004 ACS on STN

TI Catalytic humidifier and heater for the fuel stream of a fuel cell

L47 ANSWER 8 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI **Stack** design and performance of polymer **electrolyte** membrane **fuel cells**

L47 ANSWER 9 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cell stacks** and their operation method

L47 ANSWER 10 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Separator for the solid polymer **electrolyte fuel cells** and solid polymer **electrolyte fuel cell stack** using the separators

L47 ANSWER 11 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Heat absorption process using endothermic reaction with metal oxide

L47 ANSWER 12 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Solid **electrolyte fuel cell stacks**

L47 ANSWER 13 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Solid-**electrolyte fuel cells** using **heat**-resistant metals

L47 ANSWER 14 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI Heat and mass transfer effects in PEM [proton exchange membrane] **fuel cells**

L47 ANSWER 15 OF 15 HCA COPYRIGHT 2004 ACS on STN
TI **Fuel cell heat** and water removal system using electrolyte circulation

=> d L47 7,1-6,8-10, 12-15 cbib abs hitind hitstr

L47 ANSWER 7 OF 15 HCA COPYRIGHT 2004 ACS on STN
136:56398 Catalytic humidifier and heater for the fuel stream of a fuel cell. Frank, David; Chen, Xuesong; Rivard, Pierre; Cargnelli, Joseph (Hydrogenics Corporation, Can.). PCT Int. Appl. WO 2001097308 A2 20011220, 22 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-CA852 20010613. PRIORITY: US 2000-592950 20000613.
AB A method and apparatus are provided for humidifying fuel, and optionally oxidant, supplied to a fuel cell system, which can be a single **fuel cell** or a **multiplicity** of **fuel cells**. A catalytic reactor is provided, which is supplied with a portion of the fuel and the oxidant. The fuel is supplied in excess of the oxidant to the catalytic reactor, so as to generate a stream of fuel which is both heated and humidified. For a closed system, a heated and

humidified fuel flow, and optionally a heated and humidified oxidant flow,
are mixed with addnl. flows of these gases supplied to the fuel cell.
IC ICM H01M008-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 47

L47 ANSWER 1 OF 15 HCA COPYRIGHT 2004 ACS on STN
140:62285 Production of electric power and process heat. Jorge, Jose Roberto Abbud (Brazil). Braz. Pedido PI BR 2001002790 A 20030204, 13 pp. (Portuguese). CODEN: BPXXDX. APPLICATION: BR 2001-2790 20010521.
AB A water-fed solar cell having a specific salt gradient and a biodigestor producing methane-containing biogas are linked to provide **heat** and **sep. hydrogen** and carbonates. A 20% ammonia solution is used to **control** heat **flow**; the heat aids the biodigestion, improving methane yield. The hydrogen is used in a **fuel cell** to generate electricity and the heated water is desalinized to produce potable water. The combined process is efficient and cost-effective.
IC ICM C02F001-00
CC 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)
IT **Fuel cells**
Heat
Solar cells
(production of elec. power and process heat using a solar cell and a biodigestor)

L47 ANSWER 2 OF 15 HCA COPYRIGHT 2004 ACS on STN
139:152255 Computation of the conjugating **heat** transfer of **fuel** and oxidant **separated** by a heat-generating cell tube in a solid oxide **fuel cell.** Li, Pei-Wen; Schaefer, Laura; Wang, Qing-Ming; Chyu, Minking K. (Department of Mechanical Engineering, University of Pittsburgh, Pittsburgh, PA, 15261, USA). HTD (American Society of Mechanical Engineers), 372-7(Proceedings of the ASME Heat Transfer Division--2002, Volume 7), 423-430 (English) **2002.** CODEN: ASMHD8. ISSN: 0272-5673. Publisher: American Society of Mechanical Engineers.
AB A numerical model is presented to compute the inter-dependent **fields** of **flow**, temperature and the concns. of **multiple** gases in a single tubular solid oxide **fuel cell** (**SOFC**) system. It was supposed that the fuel gas supplied to the **fuel cell** is from a pre-reformer and thus contains hydrogen and proportions of carbon monoxide, carbon dioxide, steam, and methane. The model takes mixture gas properties of the fuel and oxidant as functions of the numerically obtained local temperature, pressure and species concns., which are inter-dependent and intimately related to the electrochem. reaction in the **SOFC.** In the iterative computation steps, local electrochem. parameters were simultaneously calculated based on the local parameters of pressure, temperature, and concentration of the species available at each step. Upon the convergence of the computation, both

local details and the overall performance of the **fuel**
cell could be obtained. The numerical results obtained are
helpful for better understanding of the operation of **SOFCs**.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 48
ST heat transfer conjugate solid oxide **fuel cell**
IT Oxidizing agents
(computation of conjugating **heat** transfer of **fuel**
and oxidant **separated** by heat-generating cell tube in solid oxide
fuel cell)
IT Heat transfer
(conjugating; computation of conjugating **heat** transfer of
fuel and oxidant **separated** by heat-generating cell tube
in solid oxide **fuel cell**)
IT Flow
Simulation and Modeling, physicochemical
(model to compute flow, temperature and concns. of **multiple** gases
in single tubular solid oxide **fuel cell** system)
IT **Fuel cells**
(solid oxide; computation of conjugating **heat** transfer of
fuel and oxidant **separated** by heat-generating cell tube
in solid oxide **fuel cell**)

L47 ANSWER 3 OF 15 HCA COPYRIGHT 2004 ACS on STN
137:265614 Gas **preheating** structure for **fuel cell**
stack. Akigusa, Osamu; Hoshino, Koji (Mitsubishi Materials Corp.,
Japan). Jpn. Kokai Tokkyo Koho JP 2002280023 A2 **20020927**, 14
pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-75149 20010316.
AB In a solid **electrolyte fuel cell**
stack containing separators between **cells** and
reaction gas **channels** in the separators, connecting gas
inlet at the edge of the separator to gas releasing holes facing
resp. **electrodes**; where a **channel** is formed in the
separator circling around its edge, connecting the **fuel** gas
inlet and the **fuel** gas **channel** for
preheating the **fuel** gas, and a similar **channel**
is formed for preheating the oxidant gas.
IC ICM H01M008-02
ICS H01M008-04; H01M008-12; H01M008-24
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid **electrolyte fuel cell**
separator reaction gas preheating
IT **Fuel cell separators**
(structure of separators containing **reaction** gas preheating
channels in solid **electrolyte fuel**
cell stacks)

L47 ANSWER 4 OF 15 HCA COPYRIGHT 2004 ACS on STN
136:357447 **Stacked fuel cell** using pure
hydrogen fuel and showing high energy conversion
efficiency. Nishikawa, Takao; Muneuchi, Atsuo; Sakai, Katsunori; Tanaka,
Kazuhisa; Kano, Akio (Toshiba Corp., Japan). Jpn. Kokai Tokkyo Koho JP
2002134156 A2 **20020510**, 5 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2000-331439 20001030.
AB The **fuel cell stack** is constituted by a main

stack, an auxiliary **stack,** and an **air**
-humidifying and warming chamber containing a porous membrane interposed between the **stacks;** wherein high-humidity warm **air** discharged from the main **stack** is brought in contact with one side of the porous membrane to give heat and moisture to dry and low-temperature unreacted **air** which is brought in contact with the other side of the membrane. After exchanging the heat and moisture, the unreacted **air** is supplied to the main **stack,** while the main **stack**-discharged **air** is supplied to the auxiliary **stack.** The **fuel cell** enables **cathodic** humidification and stable operation.

IC ICM H01M008-24
ICS H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **stack fuel cell air heat** moisture exchange; **humidification warming air fuel cell stack**

IT **Humidity**
(exchange; **stacked fuel cell divided** into main- and auxiliary **stacks** and interposed chamber for exchanging heat and moisture of **air**)

IT **Air**
Heat transfer
(**stacked fuel cell divided** into main- and auxiliary **stacks** and interposed chamber for exchanging heat and moisture of **air**)

IT **Fuel cells**
(**stacked; stacked fuel cell divided** into main- and auxiliary **stacks** and interposed chamber for exchanging heat and moisture of **air**)

L47 ANSWER 5 OF 15 HCA COPYRIGHT 2004 ACS on STN

136:234641 Thermoelectric reformer **fuel cell** process.
Wang, Chi S.; Lyons, J. Daniel (USA). PCT Int. Appl. WO 2002021624 A1 **20020314,** 21 pp. DESIGNATED STATES: W: AT, AU, BR, CA, CH, CN, CZ, DE, DK, ES, FI, GB, HU, ID, IL, IN, IS, JP, KR, MX, NO, NZ, PL, PT, RO, RU, SE, SG, TR, UA, ZA; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-US25027 20010809. PRIORITY: US 2000-657387 20000908.

AB An integrated process and system are disclosed for producing electricity for stationary purposes or for elec./powered vehicle using any of **multiple** hydrocarbon **input fuels,** a **fuel cell,** and a thermoelec. reformer that allows quick response to transient loads. Optional high-temperature and low-temperature water-gas shift reactors are used to convert carbon monoxide to carbon dioxide in the reformate stream; a **hydrogen separator** is used to remove carbon dioxide, carbon monoxide, the trace hydrocarbons; and a condenser is used to remove **moisture** from the reformate stream. Hydrogen gas not consumed in the **fuel cell** is stored or recycled for subsequent **input** to the **fuel cell.** H2O produced in the **fuel cell** is recycled for use in the reformer and water-gas shift reactors and is

heated with waste **heat** from the **fuel cell** and carbon dioxide, carbon monoxide, and hydrocarbons from the **hydrogen separator**. A mixer is used to vaporize the **input** fuel prior to entering the thermoelec. reformer. Some of the electricity produced in the **fuel cell** issued for powering the thermoelec. reformer and is also stored for subsequent startup and peak load purposes.

IC ICM H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49
ST thermoelec reformer **fuel cell** process
IT Recycling
(H2O and H2; thermoelec. reformer **fuel cell** process)
IT Waste heat
(management; thermoelec. reformer **fuel cell** process)
IT Heat exchangers
(regenerative; thermoelec. reformer **fuel cell** process)
IT Fuel gas manufacturing
(steam reforming; thermoelec. reformer **fuel cell** process)
IT Reforming apparatus
(steam; thermoelec. reformer **fuel cell** process)
IT **Fuel cells**
Thermoelectric devices
Water gas shift reaction
(thermoelec. reformer **fuel cell** process)
IT Hydrocarbons, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(thermoelec. reformer **fuel cell** process)
IT 7732-18-5, Water, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(recycling of; thermoelec. reformer **fuel cell** process)
IT 630-08-0, Carbon monoxide, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); REM (Removal or disposal); PROC (Process)
(thermoelec. reformer **fuel cell** process)
IT 1333-74-0P, Hydrogen, uses
RL: PUR (Purification or recovery); SPN (Synthetic preparation); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(thermoelec. reformer **fuel cell** process)
IT 124-38-9, Carbon dioxide, processes
RL: REM (Removal or disposal); PROC (Process)
(thermoelec. reformer **fuel cell** process)

L47 ANSWER 6 OF 15 HCA COPYRIGHT 2004 ACS on STN
136:72365 **Fuel cell** with internal reforming unit.
Keppeler, Berthold (Xcellsis GmbH, Germany). Eur. Pat. Appl. EP 1172876 A2 **20020116**, 8 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (German). CODEN: EPXXDW. APPLICATION: EP 2001-116158 20010704.

PRIORITY: DE 2000-10033594 20000711.

AB A **fuel cell** is equipped with at least 1 internal reforming unit, which is in direct thermal contact to a single cell consisting of an electrolyte membrane, **anode**, and a **cathode**. The electrolyte membrane is temperature-stable up to 300°, proton-conductive, comprises polymers, carbon, and/or ceramic materials. One **fuel cell** unit comprises a single cell, which is placed between 2 reforming units. The **fuel cell** consists of **stacked fuel cell** units between which single cells are arranged. The released **heat** from the **fuel cell reaction** can be used for the reforming process. The **fuel cell** unit/reforming unit **stack** is suitable for vehicles.

IC ICM H01M008-06

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell stack** internal reforming unit

IT **Fuel cell separators**
Reforming apparatus
Vehicles
(**fuel cell** with internal reforming unit)

IT Membranes, nonbiological
(ion-selective; for **fuel cell** with internal reforming unit)

IT Synthesis gas manufacturing
(reforming synthesis gas manufacturing; **fuel cell** with internal reforming unit)

IT **Fuel cells**
(with internal reforming unit)

L47 ANSWER 8 OF 15 HCA COPYRIGHT 2004 ACS on STN

134:149894 **Stack** design and performance of polymer **electrolyte** membrane **fuel cells**. Jiang, R.; Chu, D. (Sensors and Electron Devices Directorate, U.S. Army Research Laboratory, Adelphi, MD, 20783-1197, USA). Journal of Power Sources, 93(1-2), 25-31 (English) **2001**. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..

AB A review with 14 refs. of three types of **stack** structure designs of polymer **electrolyte** membrane **fuel cells** (**PEMFCs**) and evaluation under various humidities and temps., including bipolar, pseudo bipolar and monopolar (strip) **stacks**. The bipolar **stack** design is suitable for delivering moderate to high power, but if a single cell fails it may lead to a loss of power for the whole **stack**. Water, **heat**, **fuel**, and air management is required in bipolar plate design. For the pseudo-bipolar **cell stack** design it is easy to achieve high power by simple addition of more bi-cell units, but each bi-cell has to be filled with **fuel** and air **sep**. In the monopolar **cell stack** design a common gas **flow field** is shared by a whole strip, when a single **cell** fails the **stack** performance will not be affected seriously. Monopolar **cell stack** design is suitable for applications in low power and high voltage devices because of its high internal resistance.

CC 52-0 (Electrochemical, Radiational, and Thermal Energy Technology)

ST review polymer **electrolyte** membrane **fuel cell**

stack design performance
IT **Fuel cells**
(polymer **electrolyte** membrane; **stack** design and performance of **fuel cells**)

L47 ANSWER 9 OF 15 HCA COPYRIGHT 2004 ACS on STN
134:59090 **Fuel cell stacks** and their operation method. Shitaya, Yukio; Ishizawa, Masaki (Nippon Telegraph and Telephone Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2000353536 A2 **20001219**, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-162152 19990609.
AB The **fuel cell stacks** have unit **cells**, containing a polymer electrolyte membrane between a pair of gas permeable **electrodes**, a **separator** having **fuel** gas **inlet** and outlet grooves, and a separator having oxidant gas **inlet** and outlet grooves; where the separators have heat pipes connected to heat dissipating fins. In the operation of the **fuel cell stack**, the heat pipes serve as heat insulators for rapid heating of the cells during startup, and dissipate heat from the cells during normal operation.
IC ICM H01M008-04
ICS F28D015-02; H01M008-02; H01M008-10; H01M008-24
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST polymer **electrolyte fuel cell separator heat** pipe
IT **Fuel cells**
Heat pipes
(polymer **electrolyte fuel cell stacks** containing heat pipes with attached heat dissipating fins)

L47 ANSWER 10 OF 15 HCA COPYRIGHT 2004 ACS on STN
129:30118 Separator for the solid polymer **electrolyte fuel cells** and solid polymer **electrolyte fuel cell stack** using the separators. Yamaga, Noriyuki; Kudou, Hitoshi; Shinagawa, Mikio (Matsushita Electric Works, Ltd., Japan).
Jpn. Kokai Tokkyo Koho JP 10162842 A2 **19980619** Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-320206 19961129.
AB The separators have a body holding a polymer electrolyte membrane and containing gas **passages**, for supplying O and H for a **cathode** and an **anode** on the opposite sides of the electrolyte membrane, and heat dissipating fins protruded from the edges of the body. The body and the fins may be an integrated metal piece with corrosion resistant conductive coatings, the metal piece may be Al, and the corrosion coatings is selected from Ti, TiC, TiN, and C. The **fuel cell stacks** have unit **cells** containing the **electrolyte** membrane and the **electrodes** and the separators.
IC ICM H01M008-02
ICS H01M008-04; H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST polymer **electrolyte fuel cell stack separator; fuel cell heat** dissipating aluminum separator; anticorrosion coating **fuel**

cell aluminum **separator**
IT **Fuel cell separators**
(aluminum separators with anticorrosion coatings and heat dissipating fins for solid polymer **electrolyte fuel cell stacks**)
IT 7429-90-5, Aluminum, uses
RL: DEV (Device component use); USES (Uses)
(aluminum separators with anticorrosion coatings and heat dissipating fins for solid polymer **electrolyte fuel cell stacks**)
IT 7440-32-6, Titanium, uses 7440-44-0, Carbon, uses 11116-16-8, Titanium nitride 12070-08-5, Titanium carbide
RL: MOA (Modifier or additive use); USES (Uses)
(aluminum separators with anticorrosion coatings and heat dissipating fins for solid polymer **electrolyte fuel cell stacks**)

L47 ANSWER 12 OF 15 HCA COPYRIGHT 2004 ACS on STN
122:295328 Solid **electrolyte fuel cell stacks.** Taniguchi, Shunsuke; Kadowaki, Shoten; Yasuo, Koji; Akyama, Yukinori; Saito, Toshihiko (Sanyo Electric Co, Japan). Jpn. Kokai Tokkyo Koho JP 07045289 A2 **19950214** Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-258819 19930730.
AB The **fuel cell stacks** use Cr containing heat resistant alloy separators inserted between unit cells, where the separator has lower Cr content on the electrode contacting surface than in the center before heating of the stacks. This arrangement prevents diffusion of Cr into the cell cathodes.
IC ICM H01M008-02
ICS H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid **electrolyte fuel cell separator;** chromium **control fuel cell separator**
IT **Fuel cells**
(**separators, heat** resistant alloy separators with low surface chromium content for solid **electrolyte fuel cell stacks**)
IT 70409-48-2
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(heat resistant alloy separators with low surface chromium content for solid **electrolyte fuel cell stacks**)

L47 ANSWER 13 OF 15 HCA COPYRIGHT 2004 ACS on STN
119:184814 Solid-**electrolyte fuel cells** using **heat**-resistant metals. Matsuzaki, Yoshio (Tokyo Gas Co Ltd, Japan). Jpn. Kokai Tokkyo Koho JP 05166516 A2 **19930702** Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1991-350891 19911211.
AB The **fuel cells** have unit cells, each containing and electrolyte plate held between a **cathode** and an **anode,**

stacked alternately with separators. The separators are laminates having a grooved heat-resistant metal plate on their **fuel-passage** side and a grooved conductive oxide plate on the oxidant-**passage** side. The metal may be Ni or Ni alloy, and the oxide may be perovskite-type oxide.

IC ICM H01M008-02
ICS H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid **electrolyte fuel cell**
separator; nickel **separator fuel cell**
; perovskite oxide **separator fuel cell**
IT Nickel alloy, base
RL: USES (Uses)
(separators of laminates containing perovskite-type oxide and, for solid-
electrolyte fuel cells)
IT 142511-65-7, Chromium lanthanum strontium oxide (CrLa0.65Sr0.35O3)
RL: USES (Uses)
(separators of laminates containing nickel and, for solid-
electrolyte fuel cells)
IT 7440-02-0, Nickel, uses
RL: USES (Uses)
(separators of laminates containing perovskite-type oxide and, for solid-
electrolyte fuel cells)

L47 ANSWER 14 OF 15 HCA COPYRIGHT 2004 ACS on STN
112:39723 Heat and mass transfer effects in PEM [proton exchange membrane] **fuel cells**. Vanderborgh, N. E.; Huff, J. R.; Hedstrom, J. (Los Alamos Natl. Lab., Los Alamos, NM, 87545, USA). Proceedings of the Intersociety Energy Conversion Engineering Conference, 24th(Vol. 3), 1637-40 (English) **1989**. CODEN: PIECDE. ISSN: 0146-955X.

AB Heat and water management procedures in PEM **fuel cell stacks** were simulated, to evaluate their effectiveness to ensure stable, long term operation of the **fuel cells**. Drying due to transpiration at the interface, diffusion within the interface, and electroosmotic transport affect the membrane performance. Heat transfer problems due to membrane drying cause thermal fluxes which affect the output stability of the **fuel cell**. Humidification and **anode** gas dehydration strategies are outlined.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
ST proton exchange membrane **fuel cell**; water management **fuel cell** model; **heat** transfer management **fuel cell** model; **humidification** membrane **fuel cell** model
IT **Fuel cells**
(**hydrogen-oxygen**, with proton exchange membrane, heat and mass transfer effect in, modeling of)
IT Cation exchangers
(membranes, polymeric, humidification strategies for, modeling of, for **hydrogen-oxygen fuel cells**)
IT **Fuel cells**
(**separators**, proton exchange membranes, humidification

strategies for, modeling of)

L47 ANSWER 15 OF 15 HCA COPYRIGHT 2004 ACS on STN
66:51686 **Fuel cell heat** and water removal system
using electrolyte circulation. Gregory, John W.; Fetheroff, Charles W.; Fuscoe, John M. (TRW Inc.). U.S. US 3300341 **19670124,** 4 pp. (English). CODEN: USXXAM. APPLICATION: US 19620622.

AB This **fuel cell** system is provided with sensors for temperature control and electrolyte concentration control. The circulating electrolyte system includes an inlet for the introduction of concentrated electrolyte solution into the **fuel cell** and an outlet for discharge of the **electrolyte** from the **cell**. A 3-way **valve** directs the discharge to either a drain or conduit for circulation through the system. Liquid electrolyte is withdrawn from a still and passes into a heat exchanger where the temperature of the electrolyte is adjusted for optimum operating conditions. The **fuel cell,** the still, the heat exchanger and the pump, from a constant volume closed circulating system for the electrolyte. When significant amts. of H2O have accumulated in the electrolyte, the condition will be sensed by an accumulator. The accumulator consists of an expanding bellows with an elec. sensor which provides a signal when the bellows have expanded beyond a predetd. level to control the pump. The pump controls the discharge from the condenser which is connected to the vapor space of the still. When the accumulator senses the existence of excessive amts. of H2O, the operation of the pump is modified to withdraw larger amts. of vapor from the still to be condensed in the condenser and discharged through a drain. Thus, this system provides automatic heat control and water removal from **fuel cells** with the added characteristics of low weight, small volume, and a low amount of accessory power. The design is intended for marine applications.

NCL 136086000
CC 77 (Electrochemistry)
ST **FUEL CELL** WATER **SEPN;** WATER **SEPN**
FUEL CELL; MARINE **FUEL CELLS**
IT **Fuel cells**
(removal of heat and water in, by electrolyte circulation, for marine applications)
IT 7732-18-5
RL: REM (Removal or disposal); PROC (Process)
(removal of, in **fuel cells,** by **electrolyte** circulation)

=> file japio
FILE 'JAPIO' ENTERED AT 11:18:45 ON 09 APR 2004
COPYRIGHT (C) 2004 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 1 MAR 2004 <20040301/UP>
FILE COVERS APR 1973 TO NOVEMBER 28, 2003

<<< GRAPHIC IMAGES AVAILABLE >>>

=> => d L73 1-13 ibib abs ind

L73 ANSWER 1 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2002-260690 JAPIO
TITLE: STAMPED BIPOLAR PLATE FOR PEM **FUEL CELL STACK**
INVENTOR: ROCK JEFFREY A
PATENT ASSIGNEE(S): GENERAL MOTORS CORP <GM>
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002260690	A	20020913	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 2002-41288 20020219
ORIGINAL: JP2002041288 Heisei
PRIORITY APPLN. INFO.: US 2001-791528 20010223
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
AN 2002-260690 JAPIO
AB PROBLEM TO BE SOLVED: To provide a bipolar plate, particularly for **separating** adjacent **fuel cells** of a **fuel cell stack** in a PEM **fuel cell.**
SOLUTION: Bipolar plate assemblies 8 and 10 for the PEM fuel cell have a meandering **flow field** 20s, formed on one surface and a mutually combined **flow field** 20i formed on an opposite surface, so that a single plate member can be used as an **anode** current collector and a **cathode** current collector which is adjacent to the fuel cell. The bipolar plate assemblies 8 and 10 have waveform sealing arrangement for making a gas reactant flow through the fuel cell, so that the thickness of a seal becomes maximal, and a repeat distance between adjacent fuel cells becomes minimal.

IC ICM H01M008-02
ICS H01M008-10; H01M008-24

L73 ANSWER 2 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2002-164064 JAPIO
TITLE: SINGLE CELL FOR SOLID **ELECTROLYTE FUEL CELL, SEPARATOR** AND **STACK**
INVENTOR: HATANO MASAHARU; HARA NAOKI; YAMANAKA MITSUGI; UCHIYAMA MAKOTO
PATENT ASSIGNEE(S): NISSAN MOTOR CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002164064	A	20020607	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 2000-360368 20001127
ORIGINAL: JP2000360368 Heisei
PRIORITY APPLN. INFO.: JP 2000-360368 20001127
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-164064 JAPIO

AB PROBLEM TO BE SOLVED: To provide a single cell, a **separator** and a **fuel** cell enabling miniaturization and also enabling formation of a gas passage capable of establishing a uniform temperature difference between the **inlet** and outlet sides of a reaction gas and thus preventing fuel cell component materials from being damaged by thermal stresses.

SOLUTION: The single cell has a solid electrolyte layer sandwiched between a fuel **electrode** layer and an **air electrode** layer. Gas passages 34 and 35 are formed on the respective outer surfaces of the fuel **electrode** layer and the **air electrode** layer, with their gas **inlet** opening 30a and gas outlet opening 30b bored at approximately right angles to the outer surfaces of the layers. The cell has at least one pair of channeled gas passages 34 and 35 extending adjacent to each other, with one of the gas passages 34 opposed to the other of the gas passages 35 for circulation of the gas. A separator is disposed between the single cells of the solid electrolyte **fuel** cell. The **separator** has an interconnector layer sandwiched between a fuel **electrode** material layer and an **air electrode** material layer. A pair of channeled gas passages are provided on the respective outer surfaces of the fuel **electrode** material layer and the **air electrode** material layer.

COPYRIGHT: (C)2002,JPO

IC ICM H01M008-02
ICS H01M008-12

L73 ANSWER 3 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2001-338673 JAPIO
TITLE: **FUEL** CELL **SEPARATOR** ASSEMBLY SEAL STRUCTURE
INVENTOR: KUROKI YUICHI
PATENT ASSIGNEE(S): NOK CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001338673	A	20011207	Heisei	H01M008-24

APPLICATION INFORMATION
STN FORMAT: JP 2000-159638 20000530
ORIGINAL: JP2000159638 Heisei
PRIORITY APPLN. INFO.: JP 2000-159638 20000530
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-338673 JAPIO

AB PROBLEM TO BE SOLVED: To provide a **fuel** cell **separator**

assembly seal structure which can raise a dimensional stability of a reaction **electrode** section 3, while raining an assembling workability of a **fuel cell stack**.
SOLUTION: Space sections 16, 18 are prepared so that they may communicate with two or more separators 1, 2 mutually which sandwich a reaction **electrode** section 3. These two or more separators 1, 2 are unified in the piled-up state mutually, by **injection** molding of a molding material 19 which consists of a rubber, a liquid rubber, or a thermoplastic elastomer or the like into the space sections 16, 18.
COPYRIGHT: (C)2001,JPO

IC ICM H01M008-24
ICS F16J015-10

L73 ANSWER 4 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2000-323149 JAPIO
TITLE: **SEPARATOR** FOR **FUEL** CELL AND MANUFACTURING DEVICE THEREOF
INVENTOR: ITO EIKI; KOBAYASHI TOSHIRO; MORIGA TAKUYA
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000323149	A	20001124	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1999-127167 19990507
ORIGINAL: JP11127167 Heisei
PRIORITY APPLN. INFO.: JP 1999-127167 19990507
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-323149 JAPIO

AB PROBLEM TO BE SOLVED: To evenly supply the reaction gas, raise the gas flow **speed** for eliminating the produced water, and provide electrical conductivity in the thickness direction.
SOLUTION: This separator is arranged between unit **cells** in a **fuel cell stack** formed by layering plural unit cells having **electrodes** arranged on both sides of a solid high molecular film. One side surface of the separator is provided with a fuel gas flow passage for supplying the fuel gas to the adjacent unit cell, and the other side surface is provided with an oxidant gas flow passage for supplying the oxidant gas to the other adjacent unit cell. This **separator** for **fuel** cell is provided with a metal thin **plate** 31, **flow** passage forming members 32 worked into a rectangular or corrugation and arranged on both sides of the metal thin plate 31, and frame bodies 34, 35 for holding these flow passage forming members 32 in the metal thin plate 31.
COPYRIGHT: (C)2000,JPO

IC ICM H01M008-02

L73 ANSWER 5 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2000-223137 JAPIO
TITLE: **FUEL** CELL AND **SEPARATOR**
INVENTOR: MATSUKAWA MASANORI; MIZUNO KATSUHIRO; ASAI YASUYUKI;

KUWABARA YASUO; SO ITSUSHIN; KAJIO KATSUHIRO
PATENT ASSIGNEE(S): AISIN TAKAOKA LTD
AISIN SEIKI CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000223137	A	20000811	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1999-22780 19990129
ORIGINAL: JP11022780 Heisei
PRIORITY APPLN. INFO.: JP 1999-22780 19990129
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000
AN 2000-223137 JAPIO
AB PROBLEM TO BE SOLVED: To provide a **fuel** cell and a **separator** for the **fuel** cell advantageous to contribution to improvement of dispersal diffusibility that an active material in an active material-containing fluid disperses and diffuses into an **electrode** in the downstream side of a fluid channel, i.e., in the side near a fluid outlet.
SOLUTION: This **fuel cell** includes **plural** unit cells each having **electrodes** sandwiching an electrolyte film, and plural separators 3 disposed between the unit cells. The separator 3 has plural contact projecting parts 65 (75) facing to and contacting with the **electrode** with prescribed contact widths, and plural fluid channels 6a, 7a each having a channel width between the adjacent contact projecting parts 65 (75). The contact width of the contact projecting part 65 (75) on the side near a fluid outlet is set to a smaller value than the contact width of the contact projecting part 65 (75) on the side near a fluid **inlet**.
COPYRIGHT: (C)2000,JPO
IC ICM H01M008-02

L73 ANSWER 6 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2000-182637 JAPIO
TITLE: **FUEL CELL STACK**
INVENTOR: FUNAYAMA NOBUHIRO; TSUJI YUKIHIRO
PATENT ASSIGNEE(S): HINO MOTORS LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000182637	A	20000630	Heisei	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1998-355626 19981215
ORIGINAL: JP10355626 Heisei
PRIORITY APPLN. INFO.: JP 1998-355626 19981215
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000
AN 2000-182637 JAPIO
AB PROBLEM TO BE SOLVED: To compensate the output reduction due to a decrease

in the surface area of an **electrode** by distributing an **air** passage groove of a positive **electrode separator**, a **fuel** passage groove of a negative **electrode** separator and a cooling water passage groove of a cooling water separator over the whole surface of each separator with a continuous line pattern, those separators being an internal manifold type.

SOLUTION: In this **fuel cell stack**, an internal manifold is bored in the same pattern; the manifold is constituted of an **air inlet** 2 and an **air** outlet 7 in a positive **electrode separator** 1, a **fuel inlet** 4 and a fuel outlet 5 in a negative **electrode** separator, a cooling water **inlet** 6 and a cooling water outlet 3 in a cooling water separator. Six manifolds are provided on positive and negative **electrodes** as the same pattern. Passage grooves are formed with a continuous line pattern by a presswork or the like so as to be distributed between each **inlet** and outlet allover the surface of the separators. A water-repellent material such as Teflon is coated on the internal surface of the passage grooves for preventing the passage clogging due to the generation of water drops. A plurality of passage grooves of each separator is disposed to improve functions of the passage grooves. An **electrode** corresponding area is increased by 40% and an output capacity is raised.

IC ICM H01M008-02

L73 ANSWER 7 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2000-040518 JAPIO
TITLE: FUEL CELL POWER GENERATING DEVICE AND ITS OPERATING METHOD
INVENTOR: KIYOTA TORU
PATENT ASSIGNEE(S): FUJI ELECTRIC CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000040518	A	20000208	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1998-206119 19980722
ORIGINAL: JP10206119 Heisei
PRIORITY APPLN. INFO.: JP 1998-206119 19980722
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-040518 JAPIO

AB PROBLEM TO BE SOLVED: To simplify a reaction gas feeding system for feeding the gas to **multiple fuel cells** and also reduce its cost.

SOLUTION: This device is provided with air flow regulating manual **valves** 4A, 4B, 4C in the piping to feed the air to the respective air **electrodes** of fuel cells 1A, 1B, 1C, and an air flow control **valve** 2 in the main piping to divide the air to them. In addition, the device is provided with fuel gas flow regulating manual **valves** 5A, 5B, 5C in the piping to feed a fuel gas to the respective fuel

electrodes, and a fuel gas flow control **valve** 3 in the main piping to **divide** the **fuel** gas to them.

IC ICM H01M008-04

L73 ANSWER 8 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1994-124722 JAPIO
TITLE: HEATING AND **HUMIDIFYING** DEVICE AND **FUEL** CELL
INVENTOR: HASHIZAKI KATSUO
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06124722	A	19940506	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1992-271855 19921009
ORIGINAL: JP04271855 Heisei
PRIORITY APPLN. INFO.: JP 1992-271855 19921009
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994
AN 1994-124722 JAPIO
AB PURPOSE: To enable a heating and humidifying device to be made compact, allow the arbitrary setting of an applied humidity amount within saturated vapor pressure, depending upon a change in the number of stacks, and further enable differential pressure to be enlarged between gas and cooling water sides via the application of a polymer film.
CONSTITUTION: This device is characteristic in that gas and cooling water as turned into hot water state for applying heat and humidity, are respectively introduced to both sides of polymer films 44 and 45, and the films 44 and 45 or porous body is made to absorb the hot water. Also, the device is characteristic in that the absorbed water is vaporized into the gas for heat and humidity application on the other side of the body, or humidity is applied thereto concurrently via the heat of the hot water. Furthermore, the device is characteristic in that the device is integrally **stacked** on a **fuel cell** body having an **electrode** joint body with **electrodes** laid at both side of a solid electrolyte, and a **fuel** cell body with **separators** laid at both sides of the body.

IC ICM H01M008-04
ICS H01M008-10

L73 ANSWER 9 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1992-296458 JAPIO
TITLE: FUEL CELL ELECTRIC POWER GENERATING PLANT
INVENTOR: FUNATSU TETSUYA
PATENT ASSIGNEE(S): TOSHIBA CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC

JP 04296458	A	19921020	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1991-63247 19910327
ORIGINAL: JP03063247 Heisei
PRIORITY APPLN. INFO.: JP 1991-63247 19910327
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1992

AN 1992-296458 JAPIO

AB PURPOSE: To supply a sufficient fuel to strings generating electric power of a fuel cell and at the same time to keep the inside temperature of a reformer be the set temperature and carry out the inspection of the fuel cell easily while the electric power generation is carried out by installing hydrogen-rich gas flowing **rate** controlling means which corresponds to the partly string operation and an apparatus to control the **valve** open degree.

CONSTITUTION: Strings 2<SB>1</SB>-2<SB>n</SB> composed of a **plurality** of **fuel cell** 1<SB>1</SB>-1<SB>n</SB> which generate electric power using the chemical reaction energy of a hydrogen-rich gas prepared by reforming a raw fuel by a reformer 9 and **oxygen** in **air** are arranged in parallel. The hydrogen-rich gas from a **hydrogen** source 8 is **divided** at branching points B, supplied from an **inlet**-side flowing-in line of each string 2<SB>1</SB>-2<SB>n</SB> through a distributing pipe end 50, and the discharged fuel from the outlet side is collected by a gathering pipe end 51 and a part of it is re-circulated to the reformer 9 and the remaining is re-circulated to the upper stream than the branching points B by a blower 3. In this structure, A total **anode inlet** flowing **rate** detector 6 is installed in the upper stream side of the branching points B and the total flowing **rate** is sent to a controlling apparatus 10 to control the **valve** open degree of the flowing-in **valve** 11 according to the temperature and the total flowing ratio.

IC ICM H01M008-04
ICS H01M008-06

L73 ANSWER 10 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1991-049163 JAPIO
TITLE: INDIRECT INTERNAL REFORM TYPE MOLTEN CARBONATE FUEL CELL
INVENTOR: NARITA MITSUTOMO; OTSUKI SANEJI; TAWARA HIROSHI; MIYAZAKI MASAYUKI; OKADA TATSUNORI; TANAKA TOSHIHIDE; MATSUMURA MITSUIE
PATENT ASSIGNEE(S): KANSAI ELECTRIC POWER CO INC:THE MITSUBISHI ELECTRIC CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 03049163	A	19910301	Heisei	H01M008-24

APPLICATION INFORMATION
STN FORMAT: JP 1989-185256 19890717

ORIGINAL: JP01185256 Heisei
PRIORITY APPLN. INFO.: JP 1989-185256 19890717
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1991

AN 1991-049163 JAPIO

AB PURPOSE: To simplify a structure and facilitate the assembling of a cell laminated body by dividing a reformer into a raw fuel gas passage and a reform reaction section, and constituting a fuel manifold with a raw fuel gas feed manifold section and a fuel gas distributing manifold section. CONSTITUTION: The raw fuel gas 6 fed to a stack is first fed to an indirect reformer 8. For the reaction heat necessary for reform reaction, the heat generated by a cell unit is given to the reformer 8 by heat conduction, and the raw fuel gas 6 is converted into the hydrogen-rich gas by a reform **catalyst** 5. The reformed fuel gas 7 is fed to the **anode** side passage of a unit cell via a manifold 12. A fuel manifold 12 on the **fuel inlet** side is **divided** into two independent chambers: a raw fuel gas feed manifold section 12a and a hydrogen-rich reformed gas distributing manifold section 12b. The structure is simplified, gas feeding is facilitated, and the assembling of the **fuel cell stack** is extremely facilitated.

IC ICM H01M008-24
ICS H01M008-02; H01M008-06

L73 ANSWER 11 OF 13 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1986-161669 JAPIO
TITLE: FUEL CELL
INVENTOR: SHIINA KOJI; SUGITA NARIHISA; SAKAGUCHI HARUICHIRO; KOYAMA KAZUHITO; NOGUCHI YOSHIKI
PATENT ASSIGNEE(S): HITACHI LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 61161669	A	19860722	Showa	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1985-232 19850107
ORIGINAL: JP60000232 Showa
PRIORITY APPLN. INFO.: JP 1985-232 19850107
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1986

AN 1986-161669 JAPIO

AB PURPOSE: To make temperature distribution uniform and increase performance and life of a cell by installing heat pipe type cooling unit in the upper and lower parts of the highest temperature part near the center of several unit cells placed between water cooling type cooling holders. CONSTITUTION: A unit cell 1 is assembled in such a way that an **anode** 3 is placed on the upper side of an electrolyte plate 2 and a **cathode** 4 is placed on its lower side, and a **separator**

5 with **fuel** passages 7 into which fuel flows is arranged in the upper part of the **anode** 3 and a separator 5 with air passages 9 into which air 8 flows is arranged in the lower part of the **cathode** 4. Since temperature is highest in the center of five unit cells 1, heat pipe type cooling unit 10 are arranged in the upper and lower parts of the central unit cell 1 to remove heat. The quadratic curve
temperature profile is formed every cooling holder 16 in a vertical direction of **stacked fuel cell.** By arranging
heat pipe type cooling unit 10, the temperature in the central part is decreased and temperature distribution is made uniform.

IC ICM H01M008-04

L73 ANSWER 12 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1983-161269 JAPIO
TITLE: **STACKED FUEL CELL**
INVENTOR: MIYOSHI HIDEAKI; MITSUTA KENRO
PATENT ASSIGNEE(S): MITSUBISHI ELECTRIC CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 58161269	A	19830924	Showa	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1982-45088 19820319
ORIGINAL: JP57045088 Showa
PRIORITY APPLN. INFO.: JP 1982-45088 19820319
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1983

AN 1983-161269 JAPIO

AB PURPOSE: To relieve expansion or shrinkage of an electrolyte in the center
of an **electrode** by forming almost Ω-shaped flow path on the faced surface of gas **separating** plates and a **fuel electrode** and **oxidizing** agent **electrode,** and forming reservoirs of electrolyte in concavities of the flow paths.
CONSTITUTION: A flow path 1 which forms almost Ω shape when it is projected from one side, a bypass flow path 10 which makes uniform the flow **rate** of reaction gas, and T-shaped and U-shaped outside reservoirs 2a and 2a having electrolyte supply holes 3a∼3f are formed on the faced surface of a fuel **electrode** and a gas separating plate. Almost reverse Ω-shaped flow path 6 is formed on the faced surface of an **oxidizing** agent **electrode** and a gas separating plate corresponding to the fuel **electrode** side. Therefore, outlets and **inlets** 4∼7 of reaction gas are concentrated on two sides and a structure is simplified, and a contact area with an **electrode** is increased. Expansion or shrinkabe of an electrolyte in the center of the **electrode** is relieved by portion extending to the center of a T-shaped reservoir 2a.

IC ICM H01M008-02

L73 ANSWER 13 OF 13 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 1983-157063 JAPIO
TITLE: SEALING OF LAYER-BUILT FUEL CELL
INVENTOR: SATO KAZUNAO
PATENT ASSIGNEE(S): MITSUBISHI ELECTRIC CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 58157063	A	19830919	Showa	H01M008-02

APPLICATION INFORMATION
STN FORMAT: JP 1982-39912 19820312
ORIGINAL: JP57039912 Showa
PRIORITY APPLN. INFO.: JP 1982-39912 19820312
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1983

AN 1983-157063 JAPIO

AB PURPOSE: To obtain highly reliable sealing parts between each unit cell and gas-seaparating plates by positioning fusible sealing members which are resistant to both high temperature and phosphoric acid between each unit cell and gas- separating plates, and fusing the sealing members to the unit cells and the gas- separating plates by performing heat treatment.
CONSTITUTION: One of the tetrafluoroethylene-hexafluoroethylene copolymer and the perfluoroalkyl-vinylether copolymer is used as a sealing member. After fuel- side sealing members 15 and 15 are placed on the sealing surface 16' of a gas- **separating** plate 1', a **fuel** cell 14 is positioned between the sealing members 15 and 15, and placed on the gas-separating plate 1'. Next, an electrolyte matrix 13 is placed on the fuel cell 14, an oxidizer **electrode** 12 and sealing members 11 are stacked over the electrolyte matrix 13, and another gas-separating plate 1 is placed over the sealing members 11, thereby forming a unit body. Then, after assembling a layer-built fuel cell by repeatedly performing such a work as above, pressure is applied in the **stacked** direction of the **fuel cell.** After that, the **fuel cell** is subjected to **heat** treatment in an atmosphere of an inactive gas or the like so as to fuse the sealing members 11 and 15 to the unit cells and the separating plates 1, thereby forming sealing parts.

IC ICM H01M008-02
ICS H01M008-24

=> => file wpix
FILE 'WPIX' ENTERED AT 11:19:49 ON 09 APR 2004

FILE LAST UPDATED: 8 APR 2004 <20040408/UP>
MOST RECENT DERWENT UPDATE: 200424 <200424/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

>>> FOR A COPY OF THE DERWENT WORLD PATENTS INDEX STN USER GUIDE, PLEASE VISIT:

http://www.stn-international.de/training_center/patents/stn_guide.pdf <<<

>>> FOR DETAILS OF THE PATENTS COVERED IN CURRENT UPDATES, SEE
http://thomsonderwent.com/coverage/latestupdates/ <<<

>>> FOR INFORMATION ON ALL DERWENT WORLD PATENTS INDEX USER
GUIDES, PLEASE VISIT:
http://thomsonderwent.com/support/userguides/ <<<

>>> ADDITIONAL POLYMER INDEXING CODES WILL BE IMPLEMENTED FROM
DERWENT UPDATE 200403.
THE TIME RANGE CODE WILL ALSO CHANGE FROM 018 TO 2004.
SDIS USING THE TIME RANGE CODE WILL NEED TO BE UPDATED.
FOR FURTHER DETAILS: http://thomsonderwent.com/chem/polymers/ <<<

>>> NEW! FAST-ALERTING ACCESS TO NEWLY-PUBLISHED PATENT
DOCUMENTATION NOW AVAILABLE IN DERWENT WORLD PATENTS INDEX
FIRST VIEW - FILE WPIFV. FREE CONNECT HOUR UNTIL 1 MAY 2004.
FOR FURTHER DETAILS: http://www.thomsonderwent.com/dwpifv <<<

=> d L139 1-19 ti

L139 ANSWER 1 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell stack** for internal hydrogen
generation, comprises chamber for solution comprising solvent and
chemical
hydride, and **catalyst** within the chamber for **catalyzing**
reaction of solution to generate hydrogen.

L139 ANSWER 2 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell** has intermediate **fuel** gas supply
mechanism for supplying gas of low **humidity** through supply port
to **fuel** gas passage positioned between **anode**
electrode and **anode** separator.

L139 ANSWER 3 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell** e.g. for power generation, has recirculation
conduit between **anode** inlet and outlet, and water
separator provided in **conduit** between **anode** outlet and
pump, for **separating** water from **fuel** gas exiting
anode.

L139 ANSWER 4 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Cell stack** for **electrochemical fuel**
cell e.g. PEM type, has **humidification cells**
with oxidant and **fuel** flow channels **separated** by
moisture exchange membrane so as to transfer moisture from
humidified oxidant to incoming **fuel.**

L139 ANSWER 5 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Method and apparatus for selectively removing gases, e.g. carbon
monoxide,
from gas mixture, comprises use of porous membrane.

L139 ANSWER 6 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Composite membrane, for electrochemical apparatus or processes, comprises a porous polymeric sheet, which has functional material dispersed, where the pores are partially filled with a substance providing ionic conductance.

L139 ANSWER 7 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Steam processor with condensate feedback, e.g. for **fuel cell**, has suction device effectively connected to sump to suck condensate from sump and to feed it **back** into **flow** as steam at some point in chamber.

L139 ANSWER 8 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Automatic **moisture** exhauster of **fuel** tank.

L139 ANSWER 9 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Solid polymer **fuel cell** system has **fuel cell** main body, **fuel** reformer, temperature-**humidity** exchanger, **separator**, mixer, **fuel** supplier and mixed liquid supplier.

L139 ANSWER 10 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Damper** element for **fuel** injection system.

L139 ANSWER 11 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel** pressure regulator for internal engine.

L139 ANSWER 12 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel** delivery pipes to distribute **fuel** to **fuel** injection **valves** - has curve-shaped deformation part of diaphragm which protrudes into **fuel passage** and parallel part provided in-between deformation parts.

L139 ANSWER 13 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Solid **fuel** combustion appts e.g. for burn firewood, coal, garbage - has change over **valve** which stops **fuel** supply to nozzle and directs **fuel** to burner installed below grate after fixed time interval.

L139 ANSWER 14 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Solid state macromolecule electrolyte **fuel battery** system - provides pressure adjustment mechanism at entrance of circulation pump or compressor.

L139 ANSWER 15 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Gas flow reactor for crushed or powdered coal - uses radioactive probes to measure **fuel** parameters and process computer to give continuous adjustments for optimum reactor operation.

L139 ANSWER 16 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI **Fuel cell** power generatIng system - has steam separator that can regulate **fuel** gas **humidity** on **multiple fuel cell stacks** NoAbstract

Dwg 0/2.

L139 ANSWER 17 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Contact resistance-**dampened stack** of monopolar
fuel battery - has **separators** and calls
interconnected by separators NoAbstract Dwg 2/2.

L139 ANSWER 18 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Electrochemical **cell** used in electrolysis equipment - has porous
poly fluoroethylene film laminated on one side of **catalyst**
integrally joined to cation exchange membrane.

L139 ANSWER 19 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
TI Compact acid electrolyte alcohol **fuel cell** - has anode
in chamber with mixture of alcohol and water at predetermined constant
ratio and cathode contacted with oxygen containing gas.

=> => d L139 1-4,7-9,14,16-18 all

L139 ANSWER 1 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-523112 [49] WPIX
DNN N2003-415093 DNC C2003-140709
TI **Fuel cell stack** for internal hydrogen
generation, comprises chamber for solution comprising solvent and
chemical
hydride, and **catalyst** within the chamber for **catalyzing**
reaction of solution to generate hydrogen.
DC A85 E36 L03 X16
IN CHEN, X; FRANK, D; RUSTA-SALLEHY, A
PA (CHEN-I) CHEN X; (FRAN-I) FRANK D; (RUST-I) RUSTA-SALLEHY A; (HYDR-N)
HYDROGENICS CORP
CYC 100
PI WO 2003041187 A2 20030515 (200349)* EN 35p H01M000-00
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU
MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK
DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR
KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT
RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM
ZW
US 2003091877 A1 20030515 (200349) H01M008-06
ADT WO 2003041187 A2 WO 2002-CA1715 20021108; US 2003091877 A1 US 2001-986637
20011109
PRAI US 2001-986637 20011109
IC ICM H01M000-00; H01M008-06
ICS H01M008-02
AB WO2003041187 A UPAB: 20030731
NOVELTY - A **fuel cell stack** comprises:
(a) **fuel cell**(s) comprising an **anode**
with a **fuel** inlet port for hydrogen containing **fuel**
and a **cathode** with an oxidant inlet port; and
(b) chamber(s) for a solution comprising a solvent and chemical
hydride(s), having an inlet and an outlet for the solution, and a
catalyst within the chamber(s) for **catalyzing** a reaction

to generate hydrogen.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(1) an energy generating system comprising:

(a) the **fuel cell stack;**

(b) a storage mechanism for storing the solution;

(c) a circulation loop, at least connected to the storage mechanism, each chamber inlet port and each chamber outlet port, for circulating the solution from the storage mechanism through the **fuel cell stack;** and

(d) a supplying path, connected to the hydrogen inlet port of each **fuel cell anode** and each chamber outlet port, for supplying hydrogen generated inside the chamber back to the **fuel cell;** and

(2) a method for generating and supplying hydrogen to the **fuel cell,** comprising:

(i) providing a supply of solution comprising solvent and chemical anhydride(s);

(ii) supplying the solution to a **catalyst** in the **fuel cell** to **catalyze** the reaction of the solvent and the chemical anhydride to generate hydrogen;

(iii) removing the solution comprising hydrogen, by-products and unreacted solution from the **fuel cell;**

(iv) **separating** the **hydrogen** from the solution; and

(v) delivering the generated hydrogen to the **fuel cell.**

The **fuel cell stack** generates electricity and water from hydrogen and an oxidant.

USE - **Fuel cell** system for internal hydrogen generation.

ADVANTAGE - The **fuel cell** system is safe and compact, thus eliminating the need for bulky storage and/or separate reformer subsystems. A separate cooling loop may no longer be required. The chemical hydride solution stream absorbs and removes heat from the stack. The **hydrogen** gas may be **humidified** by the water vapor from the chemical hydride solution, thus a separate **humidification** system for the **anode** may no longer be required. The system is simplified, resulting in improved system efficiency and enhanced power density. Since chemical hydride reactions can take place at subzero temperatures, the **fuel cell** system can start at lower temperatures than conventional **fuel cells.**

DESCRIPTION OF DRAWING(S) - The figure is an exploded perspective view of a **fuel cell** unit located within a **fuel cell stack.**

Anode 120

Proton exchange membrane 125

Cathode 130

Dwg.1/7

FS CPI EPI

FA AB; GI; DCN

MC CPI: A12-E06C; E10-E04H; E11-S; E31-A02; L03-E04; N07-L03A

EPI: X16-C15

L139 ANSWER 2 OF 19 WPIX
AN 2003-209830 [20] WPIX
DNN N2003-167323
TI **Fuel cell** has intermediate **fuel** gas supply mechanism for supplying gas of low **humidity** through supply port to **fuel** gas passage positioned between **anode electrode** and **anode** separator.
DC X16
IN KATAGIRI, T; NUIYA, Y
PA (HOND) HONDA GIKEN KOGYO KK; (HOND) HONDA MOTOR CO LTD
CYC 5

PI	US 2002187383	A1	20021212	(200320)*		20p	H01M008-02
	CA 2389197	A1	20021208	(200320)	EN		H01M008-06
	DE 10225215	A1	20021219	(200320)			H01M008-02
	GB 2376793	A	20021224	(200320)			H01M008-04
	JP 2002367641	A	20021220	(200320)		11p	H01M008-04
	GB 2376793	B	20030716	(200355)			H01M008-04

ADT US 2002187383 A1 US 2002-164644 20020607; CA 2389197 A1 CA 2002-2389197 20020606; DE 10225215 A1 DE 2002-10225215 20020606; GB 2376793 A GB 2002-13160 20020607; JP 2002367641 A JP 2001-174862 20010608; GB 2376793 B GB 2002-13160 20020607
PRAI JP 2001-174862 20010608
IC ICM H01M008-02; H01M008-04; H01M008-06
ICS H01M004-86; H01M008-10; H01M008-24
AB US2002187383 A UPAB: 20030324
NOVELTY - A solid polymer ion exchange membrane sandwiched between **anode** separator and **cathode** separator, has **anode** and **cathode** mounted on its two surfaces. A circulation passage (48) circulates **fuel** supplied from a **fuel** gas pump (46) to a **fuel** gas passage positioned between the **anode electrode** and **anode separator.** An intermediate **fuel** gas supply mechanism (50) supplies gas of low **humidity** through a supply port to the **fuel** gas passage.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for **fuel cell** operation method.

USE - None given..

ADVANTAGE - Since low **humidity** gas is supplied to the **fuel** gas passage, the relative **humidity** of the **fuel** gas in the **fuel cell** is maintained at an optimum level for generation of electric energy, and water is prevented from being condensed effectively.

DESCRIPTION OF DRAWING(S) - The figure shows the perspective view of the **fuel cell stack.**

fuel gas pump 46
circulation passage 48
intermediate **fuel** gas supply mechanism 50
Dwg.1/12
FS EPI
FA AB; GI
MC EPI: X16-C01C; X16-C09; X16-C15

L139 ANSWER 3 OF 19 WPIX
AN 2002-090250 [12] WPIX
DNN N2002-066447 DNC C2002-027960

TI **Fuel cell** e.g. for power generation, has recirculation **conduit** between **anode** inlet and outlet, and water separator provided in **conduit** between **anode** outlet and pump, for **separating** water from **fuel** gas exiting **anode.**
DC L03 X16 X21
IN CHEN, X; FRANK, D
PA (HYDR-N) HYDROGENICS CORP
CYC 96
PI WO 2001097311 A2 20011220 (200212)* EN 17p H01M008-04
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
CA 2315134 A1 20011213 (200212) EN H01M008-04
AU 2001068867 A 20011224 (200227) H01M008-04
US 6541141 B1 20030401 (200324) H01M008-04
EP 1328989 A2 20030723 (200350) EN H01M008-04
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
KR 2003026934 A 20030403 (200353) H01M008-04
CN 1447993 A 20031008 (200403) H01M008-04
JP 2004503073 W 20040129 (200413) 34p H01M008-04
ADT WO 2001097311 A2 WO 2001-CA855 20010613; CA 2315134 A1 CA 2000-2315134 20000804; AU 2001068867 A AU 2001-68867 20010613; US 6541141 B1 US 2000-592643 20000613; EP 1328989 A2 EP 2001-947071 20010613, WO 2001-CA855 20010613; KR 2003026934 A KR 2002-716882 20021211; CN 1447993 A CN 2001-811065 20010613; JP 2004503073 W WO 2001-CA855 20010613, JP 2002-511411 20010613
FDT AU 2001068867 A Based on WO 2001097311; EP 1328989 A2 Based on WO 2001097311; JP 2004503073 W Based on WO 2001097311
PRAI US 2000-592643 20000613
IC ICM H01M008-04
ICS H01M008-10
AB WO 200197311 A UPAB: 20020221
NOVELTY - **Fuel cell** (42) has electrolyte arranged between an **anode** and **cathode,** each provided with inlet and outlet. Recirculation **conduit** including pump (54) is connected between **anode** inlet and outlet. Water separator (50) is provided in the **conduit** between **anode** outlet and pump, for **separating** water from **fuel** gas exiting the **anode.** A **fuel** inlet (44) is connected to recirculation **conduit** for **fuel** supply.

DETAILED DESCRIPTION - **Fuel** is supplied through the **anode** inlet and oxidant is supplied through the **cathode** inlet.

An INDEPENDENT CLAIM is also included for the method of recovering **moisture** from a **fuel** stream of a **fuel cell.**

USE - The **fuel cell** is used for power generation by converting chemical energy to electrical energy for power generation, electric vehicle, etc.

ADVANTAGE - The excess water produced by the **fuel cell** is recovered efficiently and recycled to **humidify** the oxidant and/or **fuel** streams, avoiding the need for a separate water source for **humidification.** The connections of dryers are periodically switched between the **cathode** inlet and the **cathode** outlet, where one dryer recovers moisture from outgoing oxidant stream and the other dryer **humidifies** the incoming oxygen stream. Moisture load on the dryers is reduced, thereby enabling longer cycles to be used. When the oxidant side is maintained at significantly higher pressure than **anode** or **fuel** side, water generated during the reaction is made to **flow back** through the membrane so that a significant amount of water appears on **anode** side and the exhausted **anode fuel** stream is significantly **humidified.** The **fuel cell** can be used in cold weather conditions, since blockage of vent and undesirable moisture level are inhibited such that formation of frost and ice particles in or around the apparatus is prevented. A replacement of the dryer to effect recharging, is eliminated.

DESCRIPTION OF DRAWING(S) - The figure shows the apparatus for recovering and recycling water on the **anode** side of **fuel cell stack.**

Fuel cell stack 42
Fuel inlet 44
Water separator 50
Pump 54
Dwg.3/5

FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C01C; X16-C09; X16-C15; X21-A01F; X21-B01A

L139 ANSWER 4 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-090249 [12] WPIX
DNN N2002-066446 DNC C2002-027959
TI **Cell stack** for **electrochemical fuel cell** e.g. PEM type, has **humidification cells** with oxidant and **fuel** flow channels **separated** by moisture exchange membrane so as to transfer moisture from **humidified** oxidant to incoming **fuel.**
DC L03 X16
IN CHEN, X; FRANK, D
PA (HYDR-N) HYDROGENICS CORP
CYC 95
PI WO 2001097309 A2 20011220 (200212)* EN 15p H01M008-04
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
CA 2315138 A1 20011213 (200212) EN H01M008-24
AU 2001068866 A 20011224 (200227) H01M008-04
US 6602625 B1 20030805 (200353) H01M008-00
ADT WO 2001097309 A2 WO 2001-CA853 20010613; CA 2315138 A1 CA 2000-2315138 20000804; AU 2001068866 A AU 2001-68866 20010613; US 6602625 B1 US

2000-592645 20000613
FDT AU 2001068866 A Based on WO 2001097309
PRAI US 2000-592645 20000613
IC ICM H01M008-00; H01M008-04; H01M008-24
AB WO 200197309 A UPAB: 20020221

NOVELTY - **Cell stack** (10) has a **fuel cell** (**FC**) **stack** and a **humidification cell stack** having **cell**(s) provided with a moisture exchange (ME) membrane. Each **humidification cell** has oxidant and **fuel** flow channels. The ME membrane separates the oxidant and **fuel** flow channels, so as to permit transfer of moisture from **humidified** oxidant discharged from the **FC stack** to dry, incoming **fuel**, flowing to the **FC stack.**

DETAILED DESCRIPTION - The **fuel cell stack** contains at least one **fuel cell,** a **humidified** oxidant inlet (24), an oxidant discharge (25), a **humidified fuel** inlet (26) and a **fuel** discharge (27). The **humidification cell stack** (30) comprises a discharged oxidant inlet (36) connected to the oxidant discharge, a **humidified fuel** outlet (34) connected to the **humidified fuel** inlet, a main **fuel** inlet (32) and a main oxidant outlet (38). The oxidant flow channels (21, 35, 43) are connected between the discharged oxidant inlet and the main oxidant outlet. The **fuel** flow channels (22, 33, 45) are connected between the main **fuel** inlet and the **humidified fuel** outlet.

An INDEPENDENT CLAIM is also included for method of **humidifying** at least one stream supplied to the **fuel cell stack.**

USE - **Cell stack** is used for **electrochemical fuel cell** of proton exchange membrane (PEM) type.

ADVANTAGE - Since the **humidification cell stacks** are provided at either end of the **fuel cell stack,** temperature of the entire **fuel cell stack** is stabilized, and hence all the individual **fuel cells** are operated substantially at the same temperature. Additionally, by providing **humidification cells** or **cell stacks** on both ends of power generation **cell stack** (20), water is recovered before it hits the power generation **cells.**

DESCRIPTION OF DRAWING(S) - The figure shows the schematic view of **fuel cell stack** comprising **humidification cell stacks.**

Cell stack 10
Main power generation **cell stack** 20
Oxidant flow channels 21, 35, 43
Fuel flow channels 22, 33, 45
Humidified oxidant inlet 24
Oxidant discharge 25
Humidified fuel inlet 26
Fuel discharge 27
Humidification cell stack 30
Main **fuel** inlet 32

Humidified Fuel outlet 34
Discharged oxidant inlet 36
Main oxidant outlet 38
Dwg.1/2
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C01C; X16-C09; X16-C15

L139 ANSWER 7 OF 19 WPIX
AN 2001-607951 [70] WPIX
DNN N2001-453895
TI Steam processor with condensate feedback, e.g. for **fuel cell,** has suction device effectively connected to sump to suck condensate from sump and to feed it **back** into **flow** as steam at some point in chamber.
DC Q68 X16
IN FAIRCHOK, J; LOGAN, V W
PA (GENK) GENERAL MOTORS CORP
CYC 2
PI DE 10105249 A1 20010823 (200170)* 6p F16T001-00
US 6610260 B1 20030826 (200357) B01J012-00
ADT DE 10105249 A1 DE 2001-10105249 20010206; US 6610260 B1 US 2000-502741 20000211
PRAI US 2000-502741 20000211
IC ICM B01J012-00; F16T001-00
ICS H01M008-06
AB DE 10105249 A UPAB: 20011129
NOVELTY - The steam processor has a housing defining a chamber (4) for processing a flow of condensable steam with a sump (100) that collects the condensate condensed from the steam and a suction device (102) effectively connected to the sump to suck the condensate from the sump and to feed it **back** into the **flow** as steam at some point in the chamber. The sump can be in a region of high pressure operation with condensate fed back to a low pressure region.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following: a chemical reactor, a **fuel** processor for converting a liquid hydrocarbon **fuel** into hydrogen gas for a **fuel cell** and a reaction chamber.

USE - Steam processors, e.g. chemical reactors, heat exchangers, liquid gas **separators, fuel cell** and **humidifiers.**

ADVANTAGE - The arrangement has an inexpensive feedback technique for removing condensate collecting in the sump of a steam processor and feeding it **back** into the **flow** of steam processed by the processor.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic sectional representation of a **fuel** processor
chamber 4
sump 100
suction device 102
Dwg.1/1

FS EPI GMPI
FA AB; GI
MC EPI: X16-C09; X16-C17

L139 ANSWER 8 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-576949 [65] WPIX
TI Automatic **moisture** exhauster of **fuel** tank.
DC Q13
IN KIM, C W
PA (HYUN-N) HYUNDAI MOTOR CO LTD
CYC 1
PI KR 2001036118 A 20010507 (200165)* 1p B60K015-03
KR 356059 B 20021012 (200326) B60K015-03
ADT KR 2001036118 A KR 1999-42969 19991006; KR 356059 B KR 1999-42969 19991006
FDT KR 356059 B Previous Publ. KR 2001036118
PRAI KR 1999-42969 19991006
IC ICM B60K015-03
AB KR2001036118 A UPAB: 20011108
NOVELTY - An automatic moisture exhauster is provided to prevent the corrosion and the imperfect combustion of a **fuel** system due to **moisture** by automatic exhausting **moisture** **separated** from **fuel**.
DETAILED DESCRIPTION - Moisture collecting barrel(12) and a drain cock(9) are installed on the lower end of a **fuel** tank(1). A floating ring(7) floating in moisture and sinking in a **fuel** is mounted in **moisture** collecting barrel(12). An upper and a lower limit sensors(5,6) for checking the upper and the lower limits of moisture are provided. A solenoid **valve**(10) opens/closes the drain cock(9) according to the floating ring(7) detection signal of the sensors(5,6). Thus, **moisture separated** from the **fuel** is automatically exhausted outwards if the quantity of the moisture becomes a predetermined quantity.
Dwg.1/10
FS GMPI
FA AB; GI

L139 ANSWER 9 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-376016 [32] WPIX
DNN N2000-282424 DNC C2000-113592
TI Solid polymer **fuel cell** system has **fuel cell** main body, **fuel** reformer, temperature-**humidity** exchanger, **separator**, mixer, **fuel** supplier and mixed liquid supplier.
DC A85 L03 X16
IN HARADA, M; HORI, M; OGAMI, Y; OHMA, A; SAITO, K; SHIMOTORI, S; SONAI, A
PA (TOKE) TOSHIBA KK
CYC 4
PI WO 2000025379 A1 20000504 (200032)* JA 49p H01M008-04
W: CA DE JP US
DE 19982376 T 20010215 (200111) H01M008-04
JP 2000578865 X 20020129 (200212) H01M008-04
US 6572994 B1 20030603 (200339) H01M008-04
ADT WO 2000025379 A1 WO 1999-JP5912 19991026; DE 19982376 T DE 1999-19982376

19991026, WO 1999-JP5912 19991026; JP 2000578865 X WO 1999-JP5912 19991026, JP 2000-578865 19991026; US 6572994 B1 Cont of WO 1999-JP5912 19991026, US 2000-604045 20000626

FDT DE 19982376 T Based on WO 2000025379; JP 2000578865 X Based on WO 2000025379

PRAI JP 1998-304079 19981026

IC ICM H01M008-04
ICS H01M008-06; H01M008-10; H01M008-18

AB WO 200025379 A UPAB: 20000706

NOVELTY - A **fuel cell** system has (a) a solid polymer **fuel cell** main body, (b) a **fuel** reformer, (c) a temperature/**humidity** exchanger, (d) a separator which separates the moisture from the pre-reacted gas from the exchanger, (e) a mixer which mixes a part of the water from the **separator** and the **fuel**, (f) **fuel** supplier and (g) a mixed liquid supplier which supplies a part of the mixed liquid to the reformer.

DETAILED DESCRIPTION - A solid polymer **fuel cell** system has (a) a solid polymer **fuel cell** main body, (b) a **fuel** reformer that supplies reformed **fuel** to the main body where the **fuel** and water vapor are supplied which have solidification point up to the freezing point, (c) a temperature/ **humidity** exchanger which exchanges heat and moisture of pre-reacted gas which passed the reaction part of the **fuel cell** main body and the unreacted gas which passed the reaction part of the **fuel cell stack**, (d) a separation means which separates the moisture from the pre-reacted gas emitted from the exchanger, (e) a mixing means which mixes a part of the water from the **separator** and the **fuel**, (f) **fuel** supply means provides **fuel** to the mixing means, and (g) a mixed liquid supply means which supplies a part of the mixed liquid to the **fuel** reformer.

USE - Used as a solid polymer **fuel cell** system which uses a solid polymer having ion conductivity as an electrolyte.

ADVANTAGE - Freezing in systems which use **fuels** which do not dissolve in water such as gasoline, is suppressed.

DESCRIPTION OF DRAWING(S) - Figure 2 is a drawing which shows an example of the system.

Main Body 100
Fuel Electrode 100a
Oxidizing **Electrode** 100b
Reformer 101
Carbon Monoxide Reducer 102
Fuel Stack 107
Heat Exchanger 110
Separator 111
Oxidizer Exhaust Gas 112
Mixer 113
Supply Pump 114
Mixed Liquid Pump 115
Vaporizer 116
Control Unit 117
Resorber Tank 118
Electric Fan 119
Water Cooling Pump 120
Sensor 121

Dwg.2/15
FS CPI EPI
FA AB; GI
MC CPI: A12-E06; L03-E04
EPI: X16-C01C; X16-C09

L139 ANSWER 14 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1995-354145 [46] WPIX
DNN N1995-263868 DNC C1995-154800
TI Solid state macromolecule electrolyte **fuel battery**
system - provides pressure adjustment mechanism at entrance of
circulation
pump or compressor.
DC L03 X16
PA (MITO) MITSUBISHI JUKOGYO KK
CYC 1
PI JP 07240220 A 19950912 (199546)* 7p H01M008-04
ADT JP 07240220 A JP 1994-29529 19940228
PRAI JP 1994-29529 19940228
IC ICM H01M008-04
ICS H01M008-10
AB JP 07240220 A UPAB: 19951122
The **fuel battery** system includes **fuel** supply
device (8) and an oxidising agent supply device (9) connected to a
fuel battery main part (10). **Hydrogen** and
oxygen **humidification** devices (11,12) are connected in between
both supply devices and the **fuel battery** main part. A
hydrogen circulation pump (15) and an independent type pressure control
valve (19) are connected in series. The circulation pump and
control **valve** are parallel to a flow rate adjustment
valve (21).
A check **valve** (17) and a **hydrogen** steam
separator (13) are connected in between the path of hydrogen flow.
An oxygen circulation pump and another independent type pressure control
valve (20) are connected in series and another flow rate
adjustment **valve** (22) is connected parallel to the pump and
valve. An oxygen check **valve** (18) and an oxygen steam
separator (14) are connected in the path of oxygen flow. Thus the solid
state macromolecule electrolyte **fuel battery** system
forms a closed loop.
ADVANTAGE - Secures stable **fuel battery** output.
Provides fixed circulation pump or compressor discharge rates.
Dwg.1/5
FS CPI EPI
FA AB; GI
MC CPI: L03-E04A
EPI: X16-C01

L139 ANSWER 16 OF 19 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1987-053221 [08] WPIX
TI **Fuel cell** power generatIng system - has steam
separator that can regulate **fuel** gas **humidity** on
multiple fuel cell stacks NoAbstract
Dwg 0/2.
DC L03 X16

```
PA   (HITA) HITACHI LTD
CYC  1
PI   JP 62008462   A  19870116 (198708)*      10p
ADT  JP 62008462 A JP 1985-144762 19850703
PRAI JP 1985-144762   19850703
IC   H01M008-04
FS   CPI EPI
FA   NOAB
MC   CPI: L03-E04
     EPI: X16-C
```

```
L139 ANSWER 17 OF 19  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   1986-060100 [09]   WPIX
TI   Contact resistance-dampened stack of monopolar
     fuel battery - has separators and calls
     interconnected by separators  NoAbstract Dwg 2/2.
DC   X16
PA   (FUEL) FUJI ELECTRIC CORP RES & DEV; (FJIE) FUJI ELECTRIC MFG CO LTD
CYC  1
PI   JP 61013573   A  19860121 (198609)*      4p
ADT  JP 61013573 A JP 1984-132666 19840627
PRAI JP 1984-132666   19840627
IC   H01M008-02
FS   EPI
FA   NOAB
MC   EPI: X16-C
```

```
L139 ANSWER 18 OF 19  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   1985-267636 [43]   WPIX
DNC  C1985-116189
TI   Electrochemical cell used in electrolysis equipment - has porous
     poly fluoroethylene film laminated on one side of catalyst
     integrally joined to cation exchange membrane.
DC   A85 E36 J03 L03
PA   (NIST) JAPAN STORAGE BATTERY CO LTD
CYC  1
PI   JP 60181291   A  19850914 (198543)*      3p
ADT  JP 60181291 A JP 1984-34742 19840224
PRAI JP 1984-34742    19840224
IC   C25B011-20
AB   JP   60181291 A UPAB: 19930925
     The cell provides cation exchange membrane, as a electrolyte,
     integrally joined together (cation exchange film) with catalyst
     electrode, where on the opposite side of the catalyst electrode
     having cation films, porous polyfluoroethylene film is laminated in such
     manner as to expose partially the catalyst electrode.
          USE/ADVANTAGE - The cell is used for electrolysis equipment
     including water electrolysis equipment, humidity sensors, de-
     humidifiers, hydrogen separation equipment,
     and fuel cells including H2-O2 fuel
     cells, methanol-oxygen fuel cells, etc.
     Cell prevents the retention of water in the pores of
     catalyst electrode without sacrificing the current collective
     ability and accelerates electrochemical reaction of the cell,
     due to partially exposed catalyst electrode.
```

0/3
FS CPI
FA AB
MC CPI: A04-E08; A12-E06; A12-E09; A12-S06C; A12-W11B; E10-E04L; E31-A; E31-D; J03-B02; L03-E04

=> file inspec

FILE 'INSPEC' ENTERED AT 11:23:03 ON 09 APR 2004
Compiled and produced by the IEE in association with FIZ KARLSRUHE

FILE LAST UPDATED: 5 APR 2004 <20040405/UP>
FILE COVERS 1969 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN THE BASIC INDEX >>>

=> d L143 1-16 ti

L143 ANSWER 1 OF 16 INSPEC (C) 2004 IEE on STN
TI Development of novel self-**humidifying** composite membranes for **fuel cells**.

L143 ANSWER 2 OF 16 INSPEC (C) 2004 IEE on STN
TI **Humid** properties of proton exchange membrane **fuel cells** and methods for **moisture** transference.

L143 ANSWER 3 OF 16 INSPEC (C) 2004 IEE on STN
TI Numerical analysis of polymer **electrolyte fuel cell** using empirical equations for overpotentials.

L143 ANSWER 4 OF 16 INSPEC (C) 2004 IEE on STN
TI Self-**humidifying** electrolyte membranes for **fuel cells**.

L143 ANSWER 5 OF 16 INSPEC (C) 2004 IEE on STN
TI Operating proton-exchange membrane **fuel cells** without external **humidification**.

L143 ANSWER 6 OF 16 INSPEC (C) 2004 IEE on STN
TI **Humidification** studies on polymer **electrolyte** membrane **fuel cell**.

L143 ANSWER 7 OF 16 INSPEC (C) 2004 IEE on STN
TI Self-**humidified** proton exchange membrane **fuel cells**: operation of larger **cells** and **fuel cell** stacks.

L143 ANSWER 8 OF 16 INSPEC (C) 2004 IEE on STN
TI Operating proton exchange membrane **fuel cells** without external **humidification** of the reactant gases. Fundamental

aspects.

L143 ANSWER 9 OF 16 INSPEC (C) 2004 IEE on STN
TI Performance of PEM **fuel cells** without external **humidification** of the reactant gases.

L143 ANSWER 10 OF 16 INSPEC (C) 2004 FIZ KARLSRUHE on STN
TI **Humidity** sensitivity of **electrochemical hydrogen cells** using calcium zirconate ceramics.

L143 ANSWER 11 OF 16 INSPEC (C) 2004 IEE on STN
TI Internal **humidifying** of PEM **fuel cells.**

L143 ANSWER 12 OF 16 INSPEC (C) 2004 IEE on STN
TI Low platinum loading wide electrodes for internal **humidification hydrogen**/oxygen polymer **electrolyte** membrane **fuel cells.**

L143 ANSWER 13 OF 16 INSPEC (C) 2004 IEE on STN
TI Internally **humidified** proton exchange membrane **fuel cell.**

L143 ANSWER 14 OF 16 INSPEC (C) 2004 IEE on STN
TI Modeling and experimental diagnostics in polymer **electrolyte fuel cells.**

L143 ANSWER 15 OF 16 INSPEC (C) 2004 IEE on STN
TI Temperature compensation in conductometry.

L143 ANSWER 16 OF 16 INSPEC (C) 2004 IEE on STN
TI **Fuel cell.**

=> d L143 2,4-7,9-13,16 all

L143 ANSWER 2 OF 16 INSPEC (C) 2004 IEE on STN
AN 2004:7825365 INSPEC DN B2004-02-8410G-069
TI **Humid** properties of proton exchange membrane **fuel cells** and methods for **moisture** transference.
AU Ma Jie; Zhang Zhong-li; Su Qiu-li; Hao Zhen-liang (Sch. of Mech. & Power Eng., Shanghai Jiaotong Univ., China)
SO Journal of North China Electric Power University (Sept. 2003) vol.30, no.5, p.54-7. 4 refs.
Published by: Editorial Board of the Journal of North China Electric Power
University
CODEN: HDIUEY ISSN: 1007-2691
SICI: 1007-2691(200309)30:5L.54:HPPE;1-W
DT Journal
TC Theoretical
CY China
LA Chinese
AB The proton exchange membrane **fuel cell** (PEMFC) performance is relevant to its humidity. The paper studies various factors

affecting **PEMFC**'s **moisture** balance. The moisture
content increases while the current density goes up, the current density
for keeping the **fuel cell**'s **moisture** balance
should increase with the humidity rising, and the gas from the cathode
should be humidified to reduce the loss from its electric resistance. The
paper analyzes the fundamentals of its moisture transference. In order to
utilize the water produced by internal reaction, water should be managed.
While water management cannot achieve sufficient **moisture,** the
fuel cell should be **humidified.** The paper
compares different modification methods. With the help of mathematical
modeling, the paper simulates the proton exchange membrane (PEM)
fuel cell's interior processes. It is predicted that the
interior modification can make PEMFC avoid the gas cross-over and then
the
fuel cell's performance does not degrade.

CC B8410G Fuel cells
CT CATHODES; ELECTRIC RESISTANCE; HUMIDITY; MOISTURE; PROTON EXCHANGE
MEMBRANE **FUEL CELLS**
ST humidity properties; **proton exchange membrane fuel cells;**
moisture transference; moisture balance; current density; cathode;
electric resistance; water management; mathematical modeling

L143 ANSWER 4 OF 16 INSPEC (C) 2004 IEE on STN
AN 2003:7558053 INSPEC DN A2003-08-8630G-016; B2003-04-8410G-030
TI Self-**humidifying** electrolyte membranes for **fuel**
cells.
AU Uchida, H.; Ueno, Y.; Hagihara, H.; Watanabe, M.
SO Journal of the Electrochemical Society (Jan. 2003) vol.150, no.1,
p.A57-62. 32 refs.
Published by: Electrochem. Soc
Price: CCCC 0013-4651/2003/150(1)/A57/6/$7.00
CODEN: JESOAN ISSN: 0013-4651
SICI: 0013-4651(200301)150:1L.a57:SHEM;1-3
DT Journal
TC Practical; Experimental
CY United States
LA English
AB We propose self-humidifying polymer electrolyte membranes (PEM) with
highly dispersed nanometer-sized Pt and/or metal oxides for polymer
electrolyte **fuel cells** (PEFCs) operated with dry H2
and O2. The Pt particles were expected to suppress the crossover by the
catalytic recombination of H2 and O2, while the oxide particles (TiO2)
that have hygroscopic property were expected to adsorb the water produced
at Pt particles together with that produced at the cathode reaction and
to
release the water once the PEM needs water. The preparation protocol of
TiO2 nanoparticles in a commercial Nafion 112 membrane via in situ
sol-gel
reactions was developed, resulting in a transparent membrane with uniform
distribution of TiO2 in the PEM. Water adsorbability increased more than
two times by dispersing only 2 wt % TiO2 in the PEM. That newly prepared
TiO2-PEM cooperated with highly dispersed Pt nanoparticles (Pt-TiO2-PEM)
was confirmed to perform a self-humidifying operation in a PEFC with dry
H2 and O2.
CC A8630G Fuel cells; A8265J Heterogeneous catalysis at surfaces and other

surface reactions; B8410G Fuel cells
CT ADSORPTION; CATALYSIS; HUMIDITY; PROTON EXCHANGE MEMBRANE **FUEL CELLS**; WATER
ST self-humidifying electrolyte membranes; **fuel cells**; highly dispersed nanometer-sized Pt; metal oxides; catalytic recombination; hygroscopic property; cathode reaction; water; preparation protocol; TiO2 nanoparticles; Nafion 112 membrane; transparent membrane; water adsorbability; PEFC; TiO2; H2; O2
CHI TiO2 bin, O2 bin, Ti bin, O bin; H2 el, H el; O2 el, O el
ET Pt; H2; O2; O*Ti; TiO2; Ti cp; cp; O cp; O*Pt*Ti; O sy 3; sy 3; Pt sy 3; Ti sy 3; Pt-TiO2; TiO; O; Ti; H

L143 ANSWER 5 OF 16 INSPEC (C) 2004 IEE on STN
AN 2002:7164152 INSPEC DN A2002-05-8630G-028; B2002-03-8410G-008
TI Operating proton-exchange membrane **fuel cells** without external **humidification**.
AU Yu Jing-rong; Yi Bao-lian; Han Ming; Ming Ping-wen (Fuel Cell R&D Center, Dalian Inst. of Chem. Phys., China)
SO Chinese Journal of Power Sources (2001) vol.25, no.5, p.327-9. 14 refs.
Published by: Tianjin Inst. Power Sources
CODEN: DIJIFT ISSN: 1002-087X
SICI: 1002-087X(2001)25:5L.327:OPEM;1-2
DT Journal
TC Experimental
CY China
LA Chinese
AB Proton exchange membrane **fuel cell** (PEMFC) with the active area of 5 cm2 was fabricated by adopting Nafion 112 membrane. The performances of the PEMFC were evaluated without external humidification for the reactant gases when the hydrogen and the oxygen were in co-flow or

in counter-flow. The results show that the PEMFC demonstrates the best performance at 60 degrees C when the hydrogen and the oxygen are in co-flow, while it can be operated steady at 80 degrees C when the gases are in counter-flow. The performance of the **PEMFC** without external **humidification** has a little difference from that of the **PEMFC** with external **humidification**. Moreover, the **PEMFC** can still be operated steady in counter-flow at 80 degrees C without external humidification when its active area is extended to 140 cm2 fabricated with Nafion 112 membrane.
CC A8630G Fuel cells; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; B8410G Fuel cells
CT MEMBRANES; PROTON EXCHANGE MEMBRANE **FUEL CELLS**
ST PEMFC; **proton-exchange membrane fuel cells**; Nafion 112 membrane; reactant gases; hydrogen and oxygen co-flow; hydrogen and oxygen counter-flow; 60 C; 80 C
PHP temperature 3.33E+02 K; temperature 3.53E+02 K
ET C

L143 ANSWER 6 OF 16 INSPEC (C) 2004 IEE on STN
AN 2001:7117903 INSPEC DN A2002-02-8630G-013; B2002-01-8410G-024
TI **Humidification** studies on polymer **electrolyte** membrane **fuel cell**.
AU Sridhar, P.; Perumal, R.; Rajalakshmi, N.; Raja, M.; Dhathathreyan, K.S. (SPIC Sci. Found., Centre for Energy Res., Chennai, India)

SO Journal of Power Sources (1 Oct. 2001) vol.101, no.1, p.72-8. 19 refs.
Doc. No.: S0378-7753(01)00625-5
Published by: Elsevier
Price: CCCC 0378-7753/01/$20.00
CODEN: JPSODZ ISSN: 0378-7753
SICI: 0378-7753(20011001)101:1L.72:HSPE;1-5
DT Journal
TC Experimental
CY Switzerland
LA English
AB Two methods of humidifying the anode gas, namely, external and membrane humidification, for a polymer electrolyte membrane **fuel** (PEMFC) **cell** are explained. It is found that the water of solvation of protons decreases with increase in the current density and the electrode area. This is due to insufficient external humidification. In a membrane-based humidification, an optimum set of parameters, such as gas flow rate, area and type of the membrane, must be chosen to achieve effective humidification. The present study examines the dependence of water pick-up by hydrogen on the temperature, area and thickness of the membrane in membrane humidification. Since the performance of the **fuel cell** is dependent more on **hydrogen humidification** than on oxygen humidification, the scope of the work is restricted to the **humidification** of **hydrogen** using Nafion(R) membrane. An examination is made on the dependence of water pick-up by **hydrogen** in membrane **humidification** on the temperature, area and thickness of the membrane. The dependence of **fuel cell** performance on membrane **humidification** and external humidification in the anode gas is also considered.
CC A8630G Fuel cells; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; B8410G Fuel cells
CT HUMIDITY; MEMBRANES; PROTON EXCHANGE MEMBRANE **FUEL CELLS**
ST **polymer electrolyte membrane fuel cell**; humidification studies; anode gas humidification; external humidification; membrane humidification; PEMFC; water of solvation of protons; current density; electrode area; gas flow rate; hydrogen water pick-up; **hydrogen humidification**; oxygen humidification; Nafion membrane; **fuel cell performance**

L143 ANSWER 7 OF 16 INSPEC (C) 2004 IEE on STN
AN 1998:5855072 INSPEC DN A9808-8630G-044; B9804-8410G-079
TI Self-**humidified** proton exchange membrane **fuel cells**: operation of larger **cells** and **fuel cell** stacks.
AU Dhar, H.P.; Lee, J.H.; Lewinski, K.A. (BCS Technol. Inc., Bryan, TX, USA)
SO FUEL CELL. 1996 Fuel Cell Seminar. Program and Abstracts
Washington, DC, USA: Courtesy Associates, 1996. p.583-6 of xxvi+794 pp. 6 refs. Availability: Annmarie Pittman, Courtesy Associates Inc, 655 15th Street NW, Suite 300, Washington, DC 20005, USA
Conference: Orlando, FL, USA, 17-20 Nov 1996
Sponsor(s): Fuel Cell Organ. Comm
DT Conference Article
TC Experimental
CY United States
LA English
AB The proton exchange membrane (PEM) **fuel cell** is

promising as the power source for use in mobile and stationary applications, primarily because of its high power density, all solid components, and simplicity of operation. For wide acceptability of this power source, its cost has to be competitive with the presently available energy sources. The **fuel cell** requires continuous **humidification** during operation as a power source. The **humidification** unit, however, increases **fuel cell** volume and weight, and therefore decreases its overall power density. Great advantages in terms of further **fuel cell** simplification can be achieved if the humidification process can be eliminated or minimized. In addition, cost reductions are associated with the ease of manufacturing and operation. Here, the authors describe how they have developed a technology of self-**humidified** operation of PEM **fuel cells** based on the mass balance of the reactants and products and the ability of the membrane electrode assembly (MEA) to retain water necessary for humidification under **cell** operating conditions.

CC A8630G Fuel cells; A8245 Electrochemistry and electrophoresis; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; A8230H Chemical exchanges (substitution, atom transfer, abstraction, disproportionation, and group exchange); B8410G Fuel cells

CT ELECTROCHEMICAL ELECTRODES; ELECTROCHEMISTRY; **FUEL CELLS** ; HUMIDITY; ION EXCHANGE; MEMBRANES

ST **proton exchange membrane fuel cells**; power density; continuous humidification; self-humidified operation; mass balance; reactants; products; membrane electrode assembly; water retention

L143 ANSWER 9 OF 16 INSPEC (C) 2004 IEE on STN

AN 1997:5704384 INSPEC DN A9721-8630G-021; B9711-8410G-021

TI Performance of PEM **fuel cells** without external **humidification** of the reactant gases.

AU Buchi, F.N.; Doanh Tran; Srinivasan, S. (Center for Electrochem. Syst. & Hydrogen Res., Texas A&M Univ., College Station, TX, USA)

SO Proceedings fo the First International Symposium on Proton Conducting Membrane Fuel Cells 1
Editor(s): Gottesfeld, S.; Halpert, G.; Landgrebe, A.
Pennington, NJ, USA: Electrochem. Soc, 1995. p.226-40 of vi+318 pp. 22 refs.
Conference: Chicago, IL, USA, 8 Oct 1995

DT Conference Article

TC Experimental

CY United States

LA English

AB Operation of polymer **electrolyte fuel cells** (**PEMFC**) without external **humidification** of the reactant gases is advantageous for the PEMFC system. This is because this mode of operation eliminates the need of a gas-humidification subsystem which is a burden to the **fuel cell** system with respect to weight, complexity, cost and parasitic power. We investigated the possible range of operating conditions for a PEMFC using dry H2/air by applying a simple model and it was found, that dry air, passing at the cathode, may be fully internally humidified by the water produced by the electrochemical reaction at temperatures up to 70 degrees C. The water distribution in the **cell** operated on dry gases is dominated by

the back-diffusion of product water to the anode. The dominating water back diffusion allows for internally **humidifying** also the **hydrogen** and prevents drying out of the anode. With optimized membrane-electrode-assemblies (MEA), self-humidified **cells** achieve similar performance as **cells** with standard MEAs and humidified gases. The performance of single **cells** and small stacks is investigated.

CC A8630G Fuel cells; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; A8245 Electrochemistry and electrophoresis; B8410G Fuel cells

CT CATHODES; ELECTROCHEMICAL ELECTRODES; ELECTROLYTES; **FUEL CELLS**; ION EXCHANGE; MEMBRANES; POLYMERS

ST **PEM fuel cells**; operating conditions; reactant gases; **polymer electrolyte fuel cells**; dry H2/air; cathode; electrochemical reaction; water distribution; back-diffusion; product water; anode; water back diffusion; internal humidification; optimized membrane-electrode-assemblies; **self-humidified cells**; 70 C

PHP temperature 3.43E+02 K

ET H2; C

L143 ANSWER 10 OF 16 INSPEC (C) 2004 FIZ KARLSRUHE on STN

AN 1997:5633839 INSPEC DN A9716-0725-001

TI **Humidity** sensitivity of **electrochemical hydrogen cells** using calcium zirconate ceramics.

AU Engelen, W.; Buekenhoudt, A.; Luyten, J.; De Schutter, F. (Vlaamse Instelling voor Technol. Onderzoek (VITO), Mol, Belgium)

SO Solid State Ionics, Diffusion & Reactions (March 1997) vol.96, no.1-2, p.55-9. 9 refs.
Doc. No.: S0167-2738(96)00615-7
Published by: Elsevier
Price: CCCC 0167-2738/97/$17.00
CODEN: SSIOD3 ISSN: 0167-2738
SICI: 0167-2738(199703)96:1/2L.55:HSEH;1-B

DT Journal

TC Experimental

CY Netherlands

LA English

AB The influence of humidity on the conduction of indium doped calcium zirconate is investigated using electrochemical hydrogen concentration **cells**. The resulting e.m.f. values measured in dry and **humidified** argon-**hydrogen** gas mixtures were found to be linear as a function of the logarithm of the hydrogen gradient but with a slope of around 70% of the expected Nernst slope in the dry mixtures. The obtained curves are discussed in terms of mixed hydrogen and oxygen conduction. In addition, electronic conduction at very low oxygen partial pressures was introduced in order to explain all the experimental observations.

CC A0725 Hygrometry; A8120L Preparation of ceramics and refractories; A7280G Conductivity of transition-metal compounds; A0670D Sensing and detecting devices; A6820 Solid surface structure; A8245 Electrochemistry and electrophoresis; A8280F Electrochemical analytical methods

CT CALCIUM COMPOUNDS; CERAMICS; ELECTRIC IMPEDANCE; ELECTRIC POTENTIAL; ELECTRICAL CONDUCTIVITY; ELECTROCHEMICAL ANALYSIS; HUMIDITY SENSORS; HYDROGEN; SCANNING ELECTRON MICROSCOPY; SURFACE STRUCTURE; ZIRCONIUM COMPOUNDS

ST humidity sensitivity; **electrochemical cells;** Ca zirconate ceramics; conduction; **electrochemical H concentration cells;** e.m.f. values; Nernst slope; partial pressure dependence; SEM; surface structure; 1200 C; 200 to 600 C; 980 C; CaZr0.9In0.1O3; H2
CHI CaZr0.9In0.1O3 ss, In0.1 ss, Zr0.9 ss, Ca ss, In ss, O3 ss, Zr ss, O ss; H2 el, H el
PHP temperature 1.47E+03 K; temperature 4.73E+02 to 8.73E+02 K; temperature 1.25E+03 K
ET Ca; H; Ca*In*O*Zr; Ca sy 4; sy 4; In sy 4; O sy 4; Zr sy 4; CaZr0.9In0.1O3; Ca cp; cp; Zr cp; In cp; O cp; H2; CaZr0.9In0.1O; In; Zr; O

L143 ANSWER 11 OF 16 INSPEC (C) 2004 IEE on STN
AN 1996:5271146 INSPEC DN A9612-8630G-003; B9607-8520-005
TI Internal **humidifying** of PEM **fuel cells.**
AU Staschewski, D. (Inst. for Neutron Phys. & Reactor Tech., Karlsruhe, Germany)
SO International Journal of Hydrogen Energy (May 1996) vol.21, no.5,
p.381-5.
8 refs.
Published by: Elsevier
Price: CCCC 0360-3199/96/$15.00+0.00
CODEN: IJHEDX ISSN: 0360-3199
SICI: 0360-3199(199605)21:5L.381:IHFC;1-V
DT Journal
TC Application; Practical; Experimental
CY United Kingdom
LA English
AB Hydrogen **fuel cells** (FC) for vehicular traction should stand out for a car-specific lightweight design. As regards FC systems containing proton exchange membranes (PEM), this quality can be considerably improved by introducing porous bipolar plates which are conditioned by a water loop and deliver hot humidifying water to the adjacent membrane-electrode assembly. According to the principle of internal **humidification,** special **fuel cells** based on sintered fiber and powder graphite were manufactured on a semi-technical scale. Self-made Pt/C electrodes hotpressed onto Nafion resulted in currents up to 200 A with pure oxygen as oxidant, providing the precondition for detailed studies of turnover and drainage rates within a monocell test arrangement.
CC A8630G Fuel cells; A8230H Chemical exchanges (substitution, atom
transfer,
abstraction, disproportionation, and group exchange); A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; A8245 Electrochemistry and electrophoresis; B8520 Transportation; B8410G Fuel cells
CT ELECTRIC VEHICLES; ELECTROCHEMICAL ELECTRODES; ELECTROCHEMISTRY; **FUEL CELLS;** HUMIDITY; HYDROGEN; ION EXCHANGE; MEMBRANES; OXYGEN; TRACTION
ST **PEM fuel cells;** internal humidification; proton exchange membranes; vehicular traction; porous bipolar plates; hot humidifying water; membrane-electrode assembly; sintered fiber; powder graphite; Nafion; oxidant; H2-O2; Pt-C
CHI H2-O2 int, H2 int, O2 int, H int, O int, H2 el, O2 el, H el, O el; Pt-C int, Pt int, C int, Pt el, C el

ET Pt; H*O; H2-O2; C*Pt; Pt-C; H; O

L143 ANSWER 12 OF 16 INSPEC (C) 2004 IEE on STN
AN 1995:5087102 INSPEC DN A9522-8630G-016; B9512-8410G-015
TI Low platinum loading wide electrodes for internal **humidification hydrogen**/oxygen polymer **electrolyte** membrane **fuel cells.**
AU Escribano, S.; Miachon, S. (Dept. de Recherche Fondamentale sur la Matiere Condensee, CEA, Grenoble, France); Aldebert, P.
SO New Materials for Fuel Cell Systems I. Proceedings of the First International Symposium on New Materials for Fuel Cell Systems
Editor(s): Savadogo, O.; Roberge, P.R.; Veziroglu, T.N.
Montreal, Que., Canada: Editions de l'Ecole Polytech. Montreal, 1995.
p.135-43 of xvi+738 pp. 24 refs.
Conference: Montreal, Que., Canada, 9-13 July 1995
Sponsor(s): Ecole Polytech. Montreal; Minist. Resources Naturelles du Quebec; Int. Assoc. Hydrogen Energy
ISBN: 2-553-00514-8
DT Conference Article
TC Experimental
CY Canada
LA English
AB The membrane electrode assemblies (MEAs) presented here used Nafion 117 as the electrolyte membrane and platinum as the catalyst. The active layer contained platinum on carbon, PTFE, and solubilized electrolyte. It was sprayed onto a carbon cloth containing essentially PTFE, or directly onto the membrane. Platinum loading was reduced to less than 0.15 mg/cm2. The final assembly was obtained by hot-pressing. Roughness factors were measured by cyclic voltammetry. Electrochemical performances were tested in a specially designed internal humidification **cell** for 100 cm2 circular electrodes. The importance of the diffusion layer and hot-pressing conditions on electrochemical behavior was confirmed. Polarization curves demonstrated a better catalyst utilization than in commercial electrodes (E-Tek).
CC A8630G Fuel cells; A8120E Powder techniques, compaction and sintering; A8280F Electrochemical analytical methods; A0630C Spatial variables measurement; A8265J Heterogeneous catalysis at surfaces and other surface reactions; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; A6630H Self-diffusion and ionic conduction in solid nonmetals; A8245 Electrochemistry and electrophoresis; B8410G Fuel cells; B7320C Spatial variables measurement; B0170G General fabrication techniques
CT CATALYSTS; ELECTROCHEMICAL ELECTRODES; **FUEL CELLS**; HOT PRESSING; HUMIDITY; ION EXCHANGE; MEMBRANES; PLATINUM; POLARISATION; POLYMERS; SOLID ELECTROLYTES; SURFACE TOPOGRAPHY MEASUREMENT; VOLTAMMETRY (CHEMICAL ANALYSIS)
ST low platinum loading wide electrodes; internal humidification; **hydrogen/oxygen polymer electrolyte membrane fuel cells**; Nafion 117; membrane electrode assemblies; electrolyte membrane; platinum catalyst; active layer; PTFE; solubilized electrolyte; carbon cloth; hot-pressing; roughness factors measurement; cyclic voltammetry; electrochemical performances; **internal humidification cell**; circular electrodes; diffusion layer; polarization curves; H2-O2

CHI H2-O2 int, H2 int, O2 int, H int, O int, H2 el, O2 el, H el, O el
ET H*O; H2-O2; H; O

L143 ANSWER 13 OF 16 INSPEC (C) 2004 IEE on STN
AN 1995:4905087 INSPEC DN A9507-8630G-010; B9504-8410G-010
TI Internally **humidified** proton exchange membrane **fuel cell.**
AU Dhar, H.P. (BCS Technol., Bryan, TX, USA)
SO Collection of Technical Papers. 29th Intersociety Energy Conversion Engineering Conference (IEEE Cat. No.94CH3478-5)
Washington, DC, USA: AIAA, 1994. p.865-70 vol.2 of 4 vol. xxxiii+1959 pp. 9 refs.
Conference: Monterey, CA, USA, 7-11 Aug 1994
DT Conference Article
TC Experimental
CY United States
LA English
AB To simplify a proton exchange membrane **fuel cell** (PEMFC) and to minimize its auxiliary subsystems, the **fuel cell** needs to operate at the ambient pressure requiring no external humidification. Towards that goal, a PEMFC has been developed and evaluated. The central part of the membrane electrolyte is cutout and a deposit of the solubilized membrane is applied directly on the electrodes. Results are presented for Nafion 117 membrane and Pt/C gas diffusion electrodes of catalyst loading 1 mg cm-2. The **fuel cells** were operated at temperatures of 30-50 degrees C and pressures of 101-240 kPa. Comparative data were also obtained with uncut Nafion 117 membrane. Results indicate that the **fuel cell** resistance is decreased with the cutout membrane. The effect of the cutout area on the **fuel cell** performance was determined by replacing the cutout membrane with a nonconducting film, which keeps only the cutout area active in the **fuel cell.** The performance of this **cell** was far greater than that of a **cell** with the cutout membrane. These results indicate that in an unhumidified **fuel cell** with a cutout membrane, the major portion of the current flows through the cutout area.
CC A8630G Fuel cells; A8245 Electrochemistry and electrophoresis; A8265F Film and membrane processes; ion exchange; dialysis; osmosis, electro-osmosis; A8230H Chemical exchanges (substitution, atom transfer, abstraction, disproportionation, and group exchange); B8410G Fuel cells
CT CARBON; ELECTROCHEMICAL ELECTRODES; ELECTROLYTES; **FUEL CELLS;** ION EXCHANGE; MEMBRANES; PLATINUM
ST internally humidification; **proton exchange membrane fuel cell;** ambient pressure operation; membrane electrolyte; solubilized membrane; Nafion 117 membrane; Pt/C gas diffusion electrodes; catalyst loading; uncut Nafion 117 membrane; **fuel cell resistance;** nonconducting film; 30 to 50 C; 101 to 240 kPa; Pt-C
CHI PtC bin, Pt bin, C bin
PHP temperature 3.03E+02 to 3.23E+02 K; pressure 1.01E+05 to 2.4E+05 Pa
ET Pt; C; C*Pt; Pt-C; PtC; Pt cp; cp; C cp

L143 ANSWER 16 OF 16 INSPEC (C) 2004 IEE on STN

```
AN   1970:89520  INSPEC     DN  A70002978; B70006253
TI   Fuel cell.
CS   Energy conversion Ltd
PI   UK 1150282 30 April 1969
AD   29 April 1966
PRAI UK 19327/65 7 May 1965
DT   Patent
CY   United Kingdom
LA   English
AB   The oxidant exhaust temperature and back pressure are maintained
constant,
     the mass flow of oxidant is regulated according to the current loading on
     the cell, and the electrolyte moisture
     content is maintained constant by regulating the cell
     temperature in accordance with the moisture content of the oxidant at the
     inlet and outlet.
CC   A8630G Fuel cells; B8410G Fuel cells
CT   FUEL CELLS


=> file compendex

FILE 'COMPENDEX' ENTERED AT 11:25:42 ON 09 APR 2004
Compendex Compilation and Indexing (C) 2004
Elsevier Engineering Information Inc (EEI). All rights reserved.
Compendex (R) is a registered Trademark of Elsevier Engineering Information
Inc.

FILE LAST UPDATED: 5 APR 2004       <20040405/UP>
FILE COVERS 1970 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
    THE BASIC INDEX >>>

=> d L146 1-8 ti

L146 ANSWER 1 OF 8  COMPENDEX  COPYRIGHT 2004 EEI on STN
TI   Investigation of Nafion[registered trademark]/HPA composite membranes for
     high temperature/low relative humidity PEMFC
     operation.

L146 ANSWER 2 OF 8  COMPENDEX  COPYRIGHT 2004 EEI on STN
TI   An analysis of water management for a PEM fuel cell
     system in automotive drive cycles.

L146 ANSWER 3 OF 8  COMPENDEX  COPYRIGHT 2004 EEI on STN
TI   Study of external humidification method in proton exchange
     membrane fuel cell.

L146 ANSWER 4 OF 8  COMPENDEX  COPYRIGHT 2004 EEI on STN
TI   High-Performance Solid Acid Fuel Cells Through
     Humidity Stabilization.
```

L146 ANSWER 5 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
TI Self-**humidifying** electrolyte membranes for **fuel cells**. Preparation of highly dispersed TiO2 particles in Nafion 112.

L146 ANSWER 6 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
TI Effect of **humidity** on PEM **fuel cell** performance. Part II. Numerical simulation.

L146 ANSWER 7 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
TI Effect of **humidity** of PEM **fuel cell** performance. Part I.Experiments.

L146 ANSWER 8 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
TI Utilizing scalar electromagnetics to tap vacuum energy.

=> d L146 3-6 all

L146 ANSWER 3 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2004(7):9240 COMPENDEX
TI Study of external **humidification** method in proton exchange membrane **fuel cell.**
AU Hyun, Duksu (Department of Chemical Engineering University of Ulsan, Ulsan 680-749, South Korea); Kim, Junbom
SO Journal of Power Sources v 126 n 1-2 Feb 16 2004 2004.p 98-103
CODEN: JPSODZ ISSN: 0378-7753
PY 2004
DT Journal
TC Theoretical; Experimental
LA English
AB Water management is essential for performance enhancement of a PEMFC because proton conductivity depends on hydration of the polymer. An external humidification method is used in a **fuel cell** experiment. **Humidity** and temperature of the gas are measured using humidity and a dew-point transmitter. An E-tek electrode and a Nafion 115 membrane was used to check the relationship between humidity and performance of a **fuel cell.** The **Fuel cell** performance experiment was carried out using a control program that is made in laboratory using HP VEE. Humidity data on the steady state was used to understand the effect of **humidity** on **fuel cell** performance. An experiment was performed to improve **fuel cell** efficiency at lower **humidity** and temperature condition. The relative **humidity** of **hydrogen** gas was lower by about 10-15% than that of air or oxygen but the temperature was higher by about 2.5 deg C. $CPY 2003 Elsevier B.V.
All rights reserved. 12 Refs.
CC 702.2 Fuel Cells; 443.1 Atmospheric Properties; 443.2 Meteorological Instrumentation; 944.1 Moisture Measuring Instruments; 641.1 Thermodynamics; 931.3 Atomic and Molecular Physics
CT ***Fuel cells**; Positive ions; Protons; High temperature effects; Polymeric membranes; Anodes; Cathodes; Atmospheric humidity; Hygrometers; Specific heat

ST Proton exchange membrane **fuel cells** (PEMFC); Dew-point transmitters

L146 ANSWER 4 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2004(4):6482 COMPENDEX
TI High-Performance Solid Acid **Fuel Cells** Through **Humidity** Stabilization.
AU Boysen, Dane A. (Materials Science California Institute of Technology, Pasadena, CA 91125, United States); Uda, Tetsuya; Chisholm, Calum R. I.; Haile, Sossina M.
SO Science v 303 n 5654 Jan 2 2004 2004.p 68-70
CODEN: SCIEAS ISSN: 0036-8075
PY 2004
DT Journal
TC Theoretical; Experimental
LA English
AB Although they hold the promise of clean energy, state-of-the-art **fuel cells** based on polymer electrolyte membrane **fuel cells** are inoperable above 100deg C, require cumbersome humidification systems, and suffer from **fuel** permeation. These difficulties all arise from the hydrated nature of the electrolyte. In contrast, "solid acids" exhibit anhydrous proton transport and high-temperature stability. We demonstrate continuous, stable power generation for both H2/O2 and direct methanol **fuel cells** operated at [similar to]250deg C using a humidity-stabilized solid acid CsH 2PO4 electrolyte. 11 Refs.
CC 702.2 Fuel Cells; 815.1 Polymeric Materials; 804.1 Organic Components; 802.2 Chemical Reactions
CT *__Fuel cells__; Polymers; Hydration; Electrolytes; Methanol
ST Humidification system
ET H*O; H2/O; H cp; cp; O cp; Cs*H; CsH; Cs cp; O*P; PO; P cp

L146 ANSWER 5 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2003(7):3463 COMPENDEX
TI Self-**humidifying** electrolyte membranes for **fuel cells**. Preparation of highly dispersed TiO2 particles in Nafion 112.
AU Uchida, Hiroyuki (Clean Energy Research Center University of Yamanashi, Kofu 400-8511, Japan); Ueno, Yoshihiko; Hagihara, Hiroki; Watanabe, Masahiro
SO Journal of the Electrochemical Society v 150 n 1 January 2003 2003.p A57-A62
CODEN: JESOAN ISSN: 0013-4651
PY 2003
DT Journal
TC Experimental
LA English
AB We propose self-humidifying polymer electrolyte membranes (PEM) with highly dispersed nanometer-sized Pt and/or metal oxides for polymer electrolyte **fuel cells** (PEFCs) operated with dry H2 and O2. The Pt particles were expected to suppress the crossover by the catalytic recombination of H2 and O2, while the oxide particles (TiO2) that have hygroscopic property were expected to adsorb the water produced

at Pt principles together with that produced at the cathode reaction and to release the water once the PEM needs water. The preparation protocol of
TiO2 nanoparticles in a commercial Nafion 112 membrane via in situ sol-gel
reactions was developed, resulting in a transparent membrane with uniform distribution of TiO2 in the PEM. Water adsorbability increased more than two times by dispersing only 2 wt % TiO2 in the PEM. That newly prepared TiO2-PEM cooperated with highly dispersed Pt nanoparticles (Pt-TiO2-PEM) was confirmed to perform a self-humidity operation in a PEFC with dry H2 and O2. 32 Refs.

CC 702.2 Fuel Cells; 815.1.1 Organic Polymers; 547.1 Precious Metals; 804.2 Inorganic Components; 801.1 Chemistry (General); 801.3 Colloid Chemistry
CT ***Fuel cells**; Reaction kinetics; Water; Adsorption; Nanostructured materials; Titanium oxides; Sol-gels; Polyelectrolytes; Platinum; Oxides; Hydrogen; Catalysis; Cathodes
ST Self humidifying electrolyte membranes; Polymer electrolyte **fuel cells**; Catalytic recombination; Water adsorbability
ET Pt; H; O; O*Ti; TiO; Ti cp; cp; O cp; O*Pt*Ti; O sy 3; sy 3; Pt sy 3; Ti sy 3; Pt-TiO

L146 ANSWER 6 OF 8 COMPENDEX COPYRIGHT 2004 EEI on STN
AN 2000(22):3984 COMPENDEX
TI Effect of **humidity** on PEM **fuel cell** performance. Part II. Numerical simulation.
AU Shimpalee, S. (Univ of South Carolina, Columbia, SC, USA); Dutta, S.; Lee,
W.K.; Van Zee, J.W.
MT Heat Transfer Division - 1999 ((The ASME International Mechanical Engineering Congress and Exposition).
MO ASME
ML Nashville, TN, USA
MD 14 Nov 1999-19 Nov 1999
SO American Society of Mechanical Engineers, Heat Transfer Division, (Publication) HTD v 364-1 1999.ASME, Fairfield, NJ, USA.p 367-374
CODEN: ASMHD8 ISSN: 0272-5673
ISBN: 0-7918-1656-7
PY 1999
MN 56554
DT Conference Article
TC Theoretical; Experimental
LA English
AB Experiments have shown that the **inlet** humidity has a significant influence on the performance of a polymer electrolyte membrane (PEM) **fuel cell**, and theory indicates that the ionic resistivity of the electrolyte membrane is dependent on the activity of water at the membrane surface. Water flux and activities change along the **flow field** direction. To understand the inner flow and mass transfer processes, a numerical model is developed to predict the flow inside a single **fuel cell**. Detailed velocity fields, pressure profiles, and current density distributions are obtained and predictions from the full-**cell** model are compared with the experimental data. Predictions indicate that flow inter-linkage between side-by-side flow **channels** occurs through the porous diffusion layer. Results also indicate that the diffusion of hydrogen is aided by

the flow toward the membrane in the **anode** side and diffusion of oxygen is opposed by the flow direction present in the **cathode** side.(Author abstract) 8 Refs.

CC 702.2 Fuel Cells; 443.1 Atmospheric Properties; 723.5 Computer Applications; 804.2 Inorganic Components; 801.4 Physical Chemistry; 641.3 Mass Transfer

CT ***Fuel cells**; Diffusion in gases; Surfaces; Mass transfer; Mathematical models; Current density; **Channel** flow; Atmospheric humidity; Computer simulation; Water

ST Polymer **electrolyte** membrane **fuel cell**; Faraday constant; Diffusion mass flux

=> file ntis

FILE 'NTIS' ENTERED AT 11:27:13 ON 09 APR 2004
Compiled and distributed by the NTIS, U.S. Department of Commerce.

FILE LAST UPDATED: 3 APR 2004 <20040403/UP>
FILE COVERS 1964 TO DATE.

<<<SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN THE BASIC INDEX (/BI) >>>

=> d L149 1-2 ti

L149 ANSWER 1 OF 2 NTIS COPYRIGHT 2004 NTIS on STN
TI Evaluation of **Fuel Cell** Reformer Emissions. Final rept.

L149 ANSWER 2 OF 2 NTIS COPYRIGHT 2004 NTIS on STN
TI Protecting **Fuel Cells** From Drowning: Water in the **fuel** is extracted before it reaches the **cells.** NTIS Tech Note.

=> d L149 2 all

L149 ANSWER 2 OF 2 NTIS COPYRIGHT 2004 NTIS on STN
AN 1990(15):07099 NTIS Order Number: NTN90-0145/XAB
TI Protecting **Fuel Cells** From Drowning: Water in the **fuel** is extracted before it reaches the **cells.** NTIS Tech Note.
CS National Aeronautics and Space Administration, Washington, DC. (01124900
0)
NR NTN90-0145/XAB
1p; Feb 1990
DT Report
CY United States
LA English
AV FOR ADDITIONAL INFORMATION: Contact: NASA Technology Transfer Div., PO Box 8757 BWI Airport, MD 21240; (301) 621-0100 ext 241. Refer to

MSC-21477/TN.
NTIS Prices: Not available NTIS
OS GRA&I9010
AB This citation summarizes a one-page announcement of technology available
for utilization. A water collector at the hydrogen **inlet** of a
stack of **fuel cells** prevents **moisture** from
'drowning' the **cells;** that is, condensing on them so that they
can no longer function. The water collector includes an empty reservoir
of the type normally used to hold electrolyte, a component that is used
in considerable numbers in a **fuel-cell** power-plant.
The empty reservoir is placed next to a cooling plate. Water in the
stream of hydrogen collects in the cooling plate. A wick carries the
collected water to the reservoir. Because the reservoir is not part of
any active **cell,** the water there does not degrade the
performance of the stack. The reservoir retains the water until it
evaporates. The water does not pour out if the stack is tipped during
handling.
CC 970 Miscellaneous energy conversion and storage
CT ***Fuel cells;** *Water removal

=>